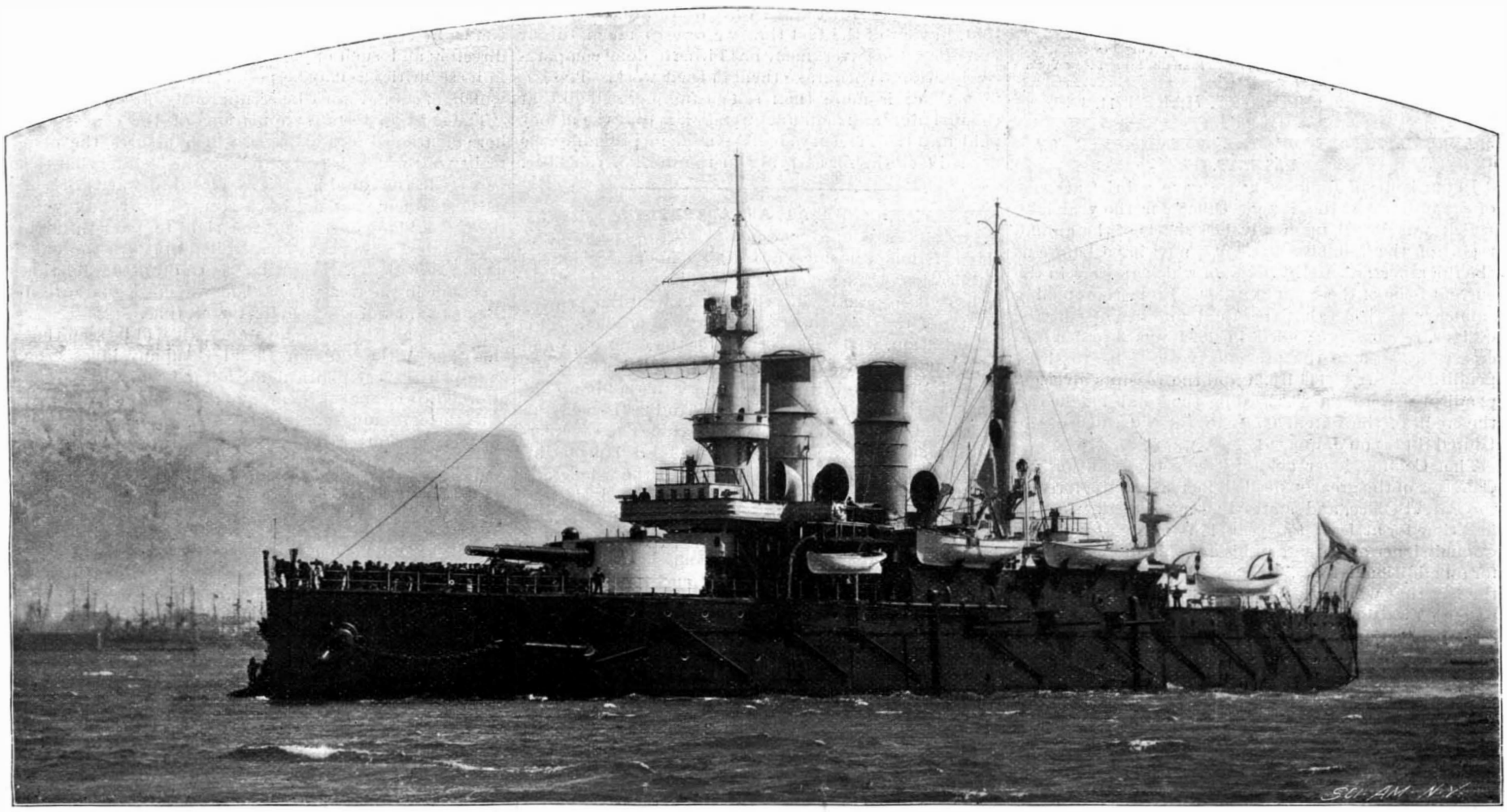
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1899, by Munn & Co.]

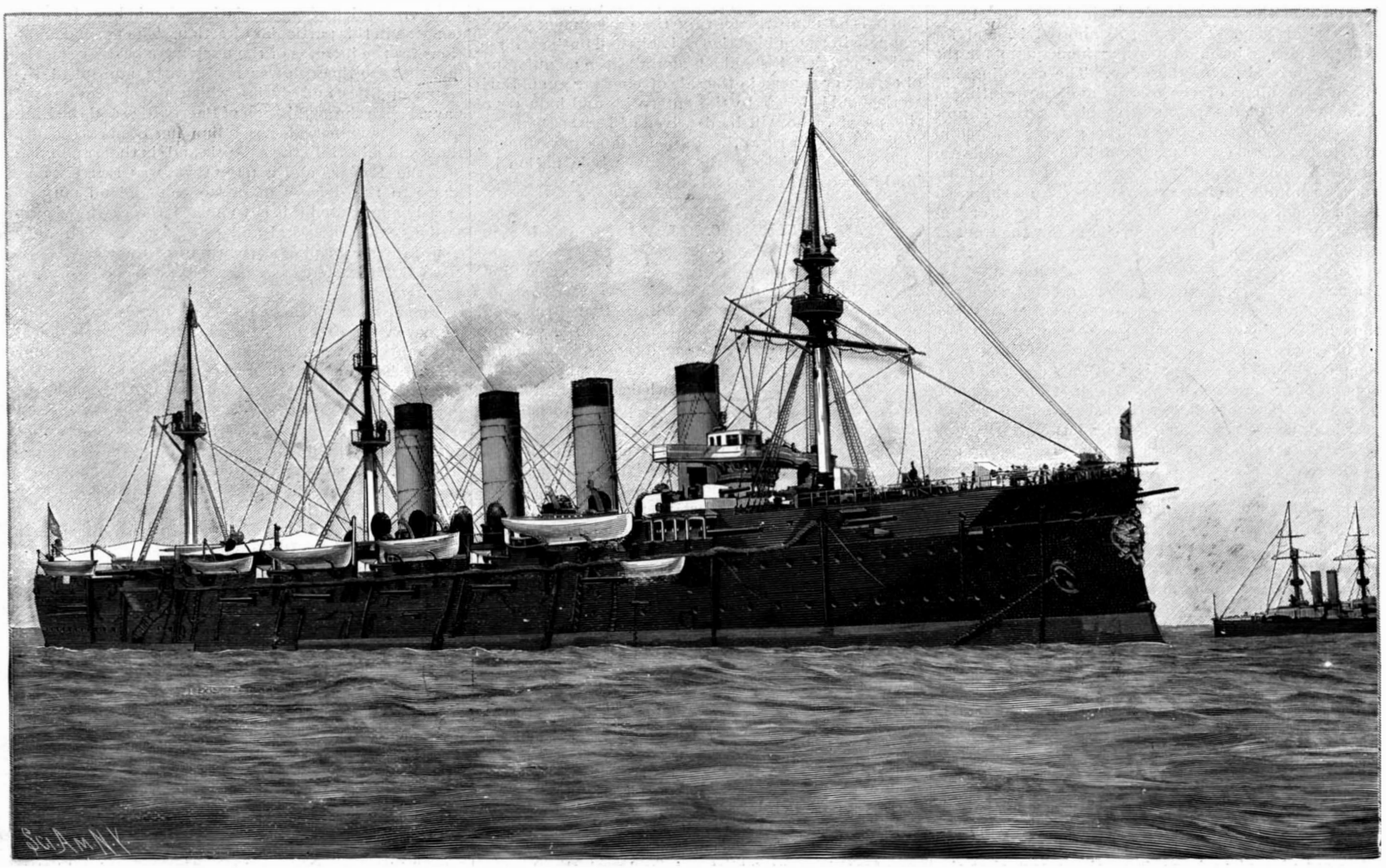
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXX.—No. 10. ESTABLISHED 1845. NEW YORK, MARCH 11, 1899. $3.00 A YEAR. WEEKLY.



1.—First-class Battleship "Sissoi Veliky." Also with modifications, "Twelve Apostles" and "Rostislav."

Displacement, 8,880 tons. **Speed,** 16 knots. **Normal Coal Supply,** 550 tons. **Armor:** Belt, 15¾ inches; deck, 3 inches; gun positions, 15¾ inches. **Armament,** four 12-inch B. L. rifles, six 6-inch rapid-firers, twelve 1·8-inch and four 1·4-inch rapid-firers, two machine guns. **Torpedo Tubes,** 6. **Complement,** 325. **Date,** 1894.



2.—First-class Armored Cruiser "Rossia." Class of Three Ships.

Displacement, 12,130 tons. **Speed,** 20 knots. **Maximum Coal Supply,** 2,500 tons. **Armor:** Belt, 10 inches; deck, 2½ inches; bulkheads, 9 inches. **Armament,** four 8-inch B. L. rifles, sixteen 6-inch rapid-firers, twelve 3-inch rapid-firers, eighteen 1·8-inch and 1·4-inch rapid-firers. **Torpedo Tubes,** 5. **Complement,** 725. **Date,** 1896.

NAVIES OF THE WORLD—IV. RUSSIA.—[See page 152.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885). ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, MARCH 11, 1899.

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

In our issue of January 28 we gave a brief account of the business of the Patent Office for the year 1898, which was based upon advance sheets of the annual report of the Commissioner. We now have before us the full report, a lengthy digest of which appears in the current issue of the SUPPLEMENT. From the opening summary we learn that the total number of patents, designs, reissues, etc., filed in 1898 was 39,663, a decrease of 12,456 on the previous year. The total expenditures were $1,136,196.20 and the receipts over expenditures were $1,538.28, while the total balance to the credit of the Patent Office in the Treasury of the United States on January 1, 1899, was $4,972,976.34.

The Commissioner acknowledges the granting by Congress of the greatly needed increase in the force of the Patent Office, and states that as a result "for the first time for at least ten years it is unnecessary for a Commissioner of Patents in his annual report to plead for an additional force." Proof of this is afforded by the fact that while on March 15, 1898, there were 14,842 patents awaiting action, by December 27, 1898, only 5,467 applications were subject to delay. The significance of these figures, however, is modified by the fact that the business of the office was seriously affected by the war. A similar reduction, due to the civil war, in the number of applications occurred in the year 1861, when there was a reduction of 40 per cent as compared with the previous year.

Commissioner Duell urgently reiterates the request of his predecessors for additional room in which to transact the business of the office. At present only a portion of the Patent Office building is allotted to patent business, the legitimate tenants of the building having to share the space with other branches of the Department of the Interior, of which the Patent Office forms a division. The space so allotted is, and for some years has been, altogether inadequate for the growing necessities of the office. The crowding has affected the filing of the records and the printing of needed copies of the patents so seriously that it now takes days to obtain copies of the patents granted in any particular class which should be obtainable on demand. The obtaining of copies is of vital importance, both in defending suits or passing on supposed infringements, and as matters now stand inventors' interests are gravely jeopardized, simply for the want of a little more room in which to carry on the printing, classifying, and filing of the necessary documents. This is a matter for prompt and thorough remedy, and the case can best be met by giving up to the Patent Office the whole of the building which is known by its name.

The report contains several proposed amendments to the patent and trade-mark laws. One suggestion is to appoint the Commissioner and Assistant Commissioner for a stated term of not less than six years. Since the year 1870 the average term of service has been only two years. This quickly recurring change is certainly not conducive to "stability of office practice."

As we are just now seeking certain important concessions from some foreign countries, the amendment permitting aliens to file caveats should be passed with as little delay as possible.

But the next amendment, providing for the publication of three thousand additional copies of the Official Gazette, is decidedly objectionable. These additional copies are to be given to Senators and Representatives for free distribution among [the faithful] manufacturers and mechanics [of their constituencies]. We believe that this political almsgiving is thoroughly bad in principle, whether it takes the shape of "free seeds" or free Gazettes. The price of the Gazette is entirely within the means of all who have need of it, and why John Doe should have to pay for his copy and Richard Roe secure his for nothing is an ethical mystery which the movers of this amendment are requested to solve.

We are pleased to learn from the report that the commission appointed by the President on July 7 last, "to revise the statutes relating to patents, trade and other marks, and trade and other commercial names," will submit a proposed trade-mark law, which will provide for the registration of trade-marks used in interstate commerce. At present, before a trade-mark can be registered, it must be put into use in trade with one or more foreign countries or Indian tribes. It is hoped that the law will be modified so as to allow the use of a trade-mark in this country without any reference to foreign countries or tribal Indians. There is also room for improvement in the matter of fees, the present fee of $25 being obviously excessive.

In concluding his report Commissioner Duell makes an eloquent plea for the full recognition by the government of the leading part played by the Patent Office and the inventor in the promotion of American industries. We fully agree with him in his conviction that, in view of the fact that we owe so much to our inventors, the government has hitherto done comparatively little to encourage them in their work. The Patent Office is more than self-sustaining, and all that the inventors and manufacturers ask is that the money paid into the Treasury shall be used in providing the needed facilities for carrying on the work of the office.

THE GOVERNMENT AS AN ADVERTISING AGENCY.

The bill introduced by Senator Burrows prohibiting the insertion of business advertisements in any official publication of the government is aimed at such abuses as have been practiced in connection with the printed matter of the Bureau of American Republics. This organization, which was formed for the ostensible and very laudable purpose of promoting trade between the United States and the South American republics, has been in the habit of inserting paid advertisements in The Monthly Bulletin and what it calls The Commercial Directory. The former contains miscellaneous information of a kind which is useful to the wholesale, retail, and commission merchants. While it is perfectly unobjectionable in its reading matter, as soon as it solicits advertisements from the public it loses its original character and becomes at once a commercial enterprise and a direct competitor with the trade journal, whose field of usefulness it consciously or unconsciously usurps. The Commercial Directory, again, uses the august influence of the government to impel commercial houses to place their names upon its lists at the rate of so many dollars per insertion. With all the "drawing" power of the government behind them, it is not surprising that these ventures have proved to be lucrative, the annual report showing a balance in hand.

It is gratifying to realize that the impropriety of the government going into industrial enterprises and becoming a commercial rival of its own citizens is being realized by Congress, and it is hoped that a stop will now be put to a tendency which is, beyond measure, a menace to the commercial rights of the people. There is no more reason why the government should compete in the publication of books and business directories than that it should undertake the manufacture of corsets or engage in the sale of chewing gum. Such work should be left to the enterprise and industry of the people, who will be deprived of legitimate means of livelihood in case the United States government, with the financial support of the whole nation behind it, becomes their rival and competitor.

AN AMERICAN CANAL AT PANAMA?

The desire of the American people to have a canal at the isthmus built with their own money and operated under their own control is very natural and perfectly proper. In a recent editorial upon the canal question The London Times says. "We are quite ready to admit that while our interests in the canal scheme are large, those of America are vital," and what is openly and frequently acknowledged by England is tacitly admitted by every civilized people throughout the world.

The strength of the recent movement in favor of building a canal at Nicaragua has lain in the mistaken impression that the Panama Canal scheme was a government enterprise and must therefore be built with French capital, controlled by French influence, and guarded by the military forces of France. If the scheme, indeed, were so entirely under the control of a foreign government, the SCIENTIFIC AMERICAN would be among the first to advocate the building of an independent canal, even though, as at Nicaragua, it should be greatly inferior, judged from an engineering and commercial standpoint. As a matter of fact, however, the new Panama Company is a private corporation, and its operations at the isthmus are no more controlled by the French government than the English-owned mines and factories in this country are controlled by the British cabinet in Downing Street.

The Panama Company, through M. Maurice Hutin, its director-general, has made a proposition to the United States government which removes at a stroke the bugaboo of foreign control, and leaves the way open for this country to step in and push the Panama Canal to completion, securing for itself at the same time every rightful advantage which could be gained by the construction of the Nicaragua Canal.

The offer made by M. Hutin is as follows: "While the new Panama Canal Company does not seek any government aid, it recognizes the national sentiment in favor of acquiring some pecuniary interest in any canal connecting the Atlantic and Pacific Oceans. Therefore the new Panama Canal Company declares that if, as the result of any investigation, the government of the United States adopt the Panama route, the company, if the government so desires, will reincorporate under the laws of the State of New York (under the laws of which State the Panama Railroad Company has existed for nearly fifty years) or of some other State of the Union, subject to the provisions of its concession, and vest its concessions and property in such corporation. It will also in said event accord to the United States such representation in its board of directors and such opportunity to acquire an interest in its securities as may be permitted by its concessions, which, of course, must be scrupulously observed."

The most important stipulations of the concessions here mentioned are article 5, which assures the neutrality of the canal, and article 6, which states that the passage of the canal is strictly closed to war vessels of nations which may not have secured by treaty with the Colombian government the right to pass through the canal at all times. The United States is the only nation to which this right has been granted, and this was done in the treaty of 1848, in which we guaranteed the neutrality of the isthmus for all time.

Looking at all the circumstances, it will be seen that this offer of the Panama Canal Company invests the canal with every political advantage which could be afforded by a canal at Nicaragua; and this fact, coupled with the enormous engineering and operating superiority of the shorter route, points to the completion of the Panama Canal as being the course most consistent with not merely our own interests, but the interests of the world at large.

At the same time we should "make haste slowly" in a matter involving such vast interests, and we think the decision of Congress to investigate the comparative advantages of the two routes, indicates the next and most obvious step to be taken at the present juncture.

THE SENATE AND THE NAVY APPROPRIATIONS.

We are glad to note that the Senate has failed in its attempt to cut down the appropriations for the navy to an extent that would have caused several of the ships now in commission to be laid up, while the number of new ships to be added to the navy would have been reduced from twelve to six.

While we have no wish to criticise the actions of the Senate, who have, no doubt, in this, as in all other legislation of the kind, acted for what they conceive to be the highest interests of the country, we greatly regret that a reduction of appropriations should have been attempted in this particular direction. The recommendations for the increase of the navy were based upon the fact that the Spanish war has greatly multiplied the responsibilities and duties which devolve upon the navy. With the acquisition of Puerto Rico and the Philippines our vulnerable coast line has been extended a thousand miles into the Atlantic and six thousand miles into the Pacific, and a navy that was scarcely adequate to the defense of our own mainland must be greatly augmented if it is to guard the scattered possessions, the thousand and one islands, which have come into our keeping as the result of the war.

It did not strike us that the requested authorization of a dozen ships was more than sufficient to meet the new conditions which we have now to face. The ships, moreover, were specially designed for work in tropical and southern seas, and at long distances from our coasts. To this end they were of great coal capacity and were in every case to be sheathed with copper. Perhaps the Senate thinks that our present ships will serve for foreign service just as well; but they would not. The battleships have not the desirable coal capacity, and, being unsheathed, they will have to make frequent visits to the dry-dock. It is a matter of history that when hostilities were pending, the voice of the Senate was strongly for war, and it is also a fact that our retention of the Philippines was strongly advocated by the same body; hence it came in the nature of a rude surprise that the Senate should have shown a disposition to so far repudiate its own policy as to refuse to vote the needful appropriation for carrying that policy into execution.

No one could be more opposed to an unnecessary increase of armaments than the SCIENTIFIC AMERICAN, and we consider that the size of our naval and military forces should be determined strictly by our actual necessities. A navy is large or small according as it exceeds or falls short of these necessities. A few years ago the United States navy was so inadequate as to be almost ridiculous. In the fifteen years previous to the late war we had brought it up to a fair standard of strength; but the war has so far added to our responsibilities that we need to make a considerable increase—at least as large as that now authorized by Congress—if we are to keep our navy up to its proper standard.

NUTRITIVE VALUES OF HUMAN FOOD.

It is certain that the majority of men are more concerned with the palatability of the food they eat than they are with its nutritive value. For the gourmand (happily a rarer individual than he was a century ago), the toothsomeness of his viands is the first and only consideration, and their nutritive qualities are only suggested to his mind, and then painfully, by the ultimate and unmistakable evidence of corpulence and the gout.

Probably the only people in our midst who seriously consider the question with a view to giving it practical application are the athletes, all of whom, as a rule, know something about the relative fat and muscle-producing qualities of the standard articles of diet.

Some few years ago Congress appropriated funds to enable the United States Department of Agriculture "to investigate and report upon the nutritive value of the various articles and commodities used for human food." Careful work along this line has been carried on during the past three or four years in the New England and other Northern States, and with a view to making the investigation as representative as possible and securing definite information regarding the food supply and consumption of people living under different conditions, it was decided to select the University of Tennessee, at Knoxville, as a representative place for the study of food nutrition in the Southern States.

Prof. Chas. E. Wait, in the University of Tennessee Record, gives a valuable paper describing the results of interesting work recently published by the Department of Agriculture in its second bulletin on the subject. The paper is given in full in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT. The investigations included dietary studies of students' clubs and mechanics' families in Tennessee; studies of the composition of Tennessee beef, mutton and chicken, and over a score of digestion experiments on healthy men.

The plan of the dietary studies includes the determination of the amounts and kinds of food bought and eaten during a stated period (from seven to thirty days), by a family or boarding club; the analysis of the food wasted, the record of the age, sex and occupation of the different subjects and the number of meals eaten by each. From the data so obtained, the actual amounts of nutrients contained in the foods were calculated. From these amounts were deducted the amount of nutrients in the waste. It is interesting to note the factors assumed in calculating meals consumed in these studies. One meal of a woman or of a boy 14 to 16 years of age is equivalent to 0·8 meal of a man at moderate muscular labor. One meal of a child 6 to 9 years of age is taken as equivalent to 0·5 meal of a man, while an average child under 2 years of age eats about 0·3 as much at a meal as a man engaged in moderate muscular labor.

Three of the studies given in the report represent the food consumption of families of mechanics, who were engaged in more or less active muscular work, which was moderately severe. Five of the studies are of clubs of college students, that is, persons engaged in mental rather than in muscular exercise. The tables show a considerable variation in the amount of protein actually consumed per man per day by the college club, ranging from 66 to 123 grammes, with an average of 92 grammes. The available energy or fuel value, however, was much more uniform, ranging from 3,450 to 3,650 calories, with an average of 3,545 calories per man per day. The daily waste of protein averaged 11 grammes or 11 per cent of the amount purchased, the waste of fuel ingredients being about 7 per cent.

The proportion of protein and the fuel value in the food of the mechanics' families was slightly larger than in that of the students' club, while it was found that the protein and energy of the dietaries examined in Tennessee differed but little from those of clubs and families examined in other parts of the United States.

The experiments to determine the composition of different kinds of meat showed that Texas range beef was the leanest of those tested, with Tennessee beef next, there being but little difference between the two. Next came the beef from the Colorado ranges, followed by that raised in New England. By far the fattest beef came from the grain-producing States, Illinois and the neighboring region, this last containing 250 per cent more fat than the Tennessee beef. The Southern and Eastern meat is superior in protein to the Western beef, but as regards the energy it is greatly inferior. Comparison of a side of Tennessee mutton with Western mutton showed again that the latter was fatter than the local meat.

Perhaps the most interesting investigation recorded in this report is the digestion experiments. The results are summarized in a table (for which and the other valuable tables the reader is referred to our current SUPPLEMENT) which brings out some very surprising facts. We learn, for instance, that the popular belief that a mixed diet is preferable to a diet composed of only one or two foods is fully indorsed by this scientific investigation, as the following facts will show: The average of ten experiments with an exclusively milk diet showed 92·1 per cent of the protein and 86·3 per cent of the carbohydrates to be digested. Five experiments with an exclusively bread diet or with bread and sugar showed 82 per cent of the protein and 99 per cent of the carbohydrates to be digested. On the other hand, five experiments with a diet of bread and milk showed 97·1 per cent of the protein and 98·7 per cent of the carbohydrates to be digested. That is to say, the protein in milk alone or in bread alone seems to be much less completely digested than when the two are eaten together. It has yet to be proved that similar results would follow if other food materials were made the subject of comparison; but the general conclusion is drawn by the author of this very interesting paper that more complete digestion would occur when the diet was nearly normal, that is to say, made up of a number of food materials.

OUR CONSULAR SERVICE IN RELATION TO AMERICAN MANUFACTURES.

American manufactures seem likely to make their greatest record in the fiscal year which will end on June 30 next. Advance reports show that in the last seven months the exportation of domestic manufactures is $23,000,000 greater than the highest record ever made in the corresponding month of any fiscal year. During the seven months ending February 1, 1899, the exports of domestic manufactures amounted to over $182,000,000, or an average of $1,000,000 a day for every business day of that period. A decade ago the imports of manufactures were more than double the exports of manufactures; now the exports of manufactured goods are twenty-five per cent greater than the imports of manufactured articles. In ten years exports of the articles which we are considering have increased from $78,751,433 to $182,336,503, and our magnificent trade balance is to-day the envy of the world.

The government of the United States has very wisely adopted a plan of obtaining information from abroad which is simple and which is working admirably. The various officers of the consular service are instructed to notify the Department of State of any opening for American trade, any large contracts to be awarded, and matters of a like nature; besides, they give news of new industries, valuable statistics, and information as to trade methods in vogue abroad. These reports are printed daily in what are called "Advance Sheets of the Consular Reports," which are issued to the press and interested parties, and each month they are gathered together in a neat little magazine called "Consular Reports."

At the present time the United States has 39 consul-generals, 260 consuls, and 33 commercial agents, 332 officials in all, who are gathering information in all parts of the world, in addition to the other duties which pertain to their office. These gentlemen are many of them trained business men, who are quick to seize upon the significant features of trade, and who are able to deal with them comprehensively. The value of their reports is freely acknowleged by foreign governments. We have deemed the reports of our consuls abroad to be of such importance, in view of our constantly increasing foreign trade, that we have decided to establish in our SUPPLEMENT a new department, where many of these reports will be published in full, or where, owing to their length, it is not possible to do this, a careful abstract will be made. We feel sure that this feature will be appreciated by the readers of our SUPPLEMENT, and doubtless many who are not at present regular subscribers to the SUPPLEMENT would be glad to become so, owing to the importance of this new feature. We shall also publish consular reports which do not deal specifically with trade, but with new industries, etc., both in our SCIENTIFIC AMERICAN and our SCIENTIFIC AMERICAN SUPPLEMENT, as has been our custom heretofore.

COST OF ELECTRIC LIGHT.

BY ALTAN D. ADAMS.

In the judgment of many persons the incandescent lamp furnishes the most agreeable and satisfactory form of artificial light.

This opinion is due to the fact that incandescent light is more like sun light than that of gas, and also to the absence of combustion, with its consequent gases and odors and fire risk.

The increased cost of electric light over gas, when taken from public supply, is, without doubt, the main hindrance to its greatly extended use, and a glance at comparative figures shows the difference in cost for many cases to be considerable.

Gas at one dollar per thousand feet costs one mill per cubic foot, and as a regular gas burner requires five cubic feet per hour for a nominal sixteen candle power light, the cost per burner is five mills per hour.

The cost of incandescent light to the consumer varies much in different places and even between different cases in the same place.

There are two ways in which the charge for electric light is regulated. One is based on a certain charge per lamp hour and an agreement as to the number of hours per day or month the lamps shall be presumed to have burned. Under this arrangement it is usually impossible to tell beforehand whether the supply company or the consumer has the worst end of the bargain. The other and more satisfactory way to regulate the charge for electric light is by meter, and the meter records the actual electric energy used, and no more. It is the fairest method for both parties. A charge of a certain sum per lamp hour is known as a contract rate, and is based on one cent per lamp hour in many cases, though it may be higher and is frequently lower than this.

The unit of electric energy measured by the meter is the watt-hour, and a charge of fifteen cents per one thousand watt-hours is common, though contracts covering service for a large number of lamps can usually be made at a better figure. Incandescent lamps of sixteen candle power can be had from the large makers at twenty-five cents each in small lots and at twenty cents each in lots of two hundred; from the small makers these prices can be improved on by several cents per lamp. In nearly all large cities and many small ones electric current is sold on the meter method, and the cost of light to any consumer will depend to a large extent on the efficiency of the lamps he uses. By the efficiency of a lamp is of course meant the power or watts required to run it compared with its candle power.

Incandescent lamps of sixteen candle power look much alike, but they vary fully forty per cent in the watts required for the same light. Thus, sixteen candle lamps may be had from the same makers at the same price which require from fifty to seventy watts to operate per lamp. To get the more efficient lamps it is only necessary to so order, and then, if their quality is doubted, have a test made by a disinterested engineer. At the rate of fifteen cents per thousand watts per hour, the cost per hour for a fifty watt lamp will evidently be seven and one-half mills, or one and one-half the cost of gas, while for a seventy watt lamp the cost per hour will be ten and one-half mills, or slightly more than twice the cost of gas. A large per cent of the charge for operating incandescent lamps may thus be saved by using only those of high efficiency.

If the light from an incandescent lamp remained constant until the lamp gave out, the only thing necessary for economy would be to select the most efficient lamp; but, unfortunately, the light decreases rapidly in amount as the lamp grows older, while the power required by the lamp remains nearly constant. It is common for incandescent lamps to burn as long as one thousand hours, and many lamps, after burning this long, give less than half the light given at the start. The cheapest thing to do with a lamp that has fallen as much as twenty per cent in candle power is to destroy it and put in a new one, as the cost of a lamp is small compared with the cost of energy required to operate it during its life. Consider a seventy watt lamp that has burned one thousand hours. It has evidently consumed seventy thousand watt-hours, which, at fifteen cents each, have cost ten dollars and fifty cents. The lamp cost twenty cents.

Again, take a fifty watt lamp that has burned eight hundred hours. Forty thousand watt-hours have been consumed, which, at fifteen cents, amount to six dollars, the cost of lamp being again but twenty cents. In the first case the cost of lamp is about two per cent and in the last about three and one-third per cent of the energy consumed. Were fifty watt lamps burned only four hundred hours and only three-fourths as many used as when burned for eight hundred, more light would be had at a less total cost. The fact that consumers put up with electric lamps that have burned eight, ten, and even twelve hundred hours and lost fully half their candle power, shows that a sixteen candle power lamp is not required in many places, and this is confirmed by the many gas jets which, through poor gas or dirty pipes, give but ten or twelve candles.

It can also be shown that the great advantage of the electric light is in its quality rather than its volume, which, together with above facts, leads to the conclusion that a smaller lamp, say of ten candle power, could well be used instead of the sixteen candle incandescent lamp in many places, at a large saving in cost of operation. Above opinion is strengthened by the very general use of the ten candle incandescent lamp in England and the continent of Europe, for places where the sixteen candle lamp would be used by us. Ten candle power lamps can readily be had that require but thirty-five watts, costing, at fifteen cents per thousand watts per hour, but five and one-quarter mills per lamp hour, or about that of gas. These ten candle lamps, if burned only two or three hundred hours each, give about the same average light as the sixteen candle lamp burned eight hundred hours, and at about two-thirds the cost.

THE Congressional Library at Washington has a set of The London Times from 1796. It is not strange that a file of this newspaper is now of great value, for in 1800 only 1,000 copies were printed. The set in the Boston Public Library dates from 1808 and consists of two hundred and thirty-two bound volumes.

WAX WORKS AT WESTMINSTER ABBEY.

Westminster Abbey is the last place where one would expect to find a collection of wax works, and many of those who know the Abbey quite well will be surprised to learn that the historic building contains a collection of wax works of absorbing interest, and of greater authenticity than those exhibited at the celebrated Madame Tussaud's, also in London. Either because the authorities of the church are ashamed of this collection, or because they fear to have it injured, it is shown only on the free days by an order from the Dean. The collection is preserved in a chamber or gallery over St. John the Baptist's Chapel, and access to it is gained by a modern flight of stairs which cover the ancient stone steps. They lead to the old oratory, or chantry chapel, where the wax effigies have been collected since about the beginning of this century. They are preserved in glass cases and are vulgarly known as the "Ragged Regiment," and also as the "Play of the Dead Volks."

The additions to this rather incongruous side show occurred only after the death of the illustrious people they represented. The funerals of notable men and women generally took place by torch light, and it was not until the eighteenth century that it was abandoned. To the spectators of these processions the chief object of interest was not the coffin of the deceased, but the "herse" which was borne before it. This name has nothing to do directly with the funeral carriage of to-day, but the name of the modern vehicle is derived from the older "herse," which was a wooden platform decorated with black hangings bearing a waxen image of the deceased whose remains were about to be consigned to the tomb. The head of the defunct monarch, statesman, or warrior was modeled in wax, and an effigy was built up and clad in the actual garments worn by the deceased in his or her lifetime, but embellished with false gems. When the coffin had been deposited in the vault, the wax effigy was either placed over the tomb as a sort of temporary substitute for a stone monument or in some other convenient spot.

They usually remained as a pageant in the Abbey for about a month; in the case of sovereigns, for a longer period. In the Abbey the royal effigies can be traced back to the fourteenth century. The origin of the custom is unknown, but it is surmised that it was derived from the Roman habit of introducing into the funeral procession of a notable a lay figure representing the ancestor of the deceased. The old English had a mania for making wax figures, and the populace was always sure to turn out en masse when it was known that there would be an effigy in evidence. There could be nothing more incongruous and grewsome than the appearance of the Abbey when these figures were scattered around, but now they are preserved like zoological specimens, which takes away from their horror, and they are only interesting and amusing. The wax images which now exist are eleven in number, and the attention is naturally directed to that of Queen Elizabeth. The weird figure sits bolt upright, bedecked with quantities of paste jewels, and in her right hand she holds a scepter and in the left an orb. Her shrewish face, as represented in the effigy, would undoubtedly be an arch-authentic portrait if it were not for the fact that the figure was restored in 1760, so that the face is probably a copy of that on her tomb. The original figure which was carried at her funeral was quite worn out in 1708, the only remains of the robes being "a dirty ruff." At any rate, the restorers were true to tradition, because her majesty is attired in an extravagantly long-waisted dress with which her numerous portraits have made us familiar, and springing from the bodice is a pair of immense panniers which support a ponderous velvet robe covered with gold embroidery, and around her neck is a curious spreading ruff stiffened with wire, and from this descends the long, straight, stiff bodice, made stiffer and heavier by a mass of rich silver embroidery. At a respectful distance from the mighty queen is Charles II. He is certainly the most amusing effigy in the collection. He looks as though he were in the last stages of inebriety, and as the face was probably modeled from death, it is of historic importance. The "Merry Monarch" is clad in a curious robe of red and blue velvet, sorely faded from its ancient splendor; his profuse locks are topped by a limp-looking hat with a tawdry feather. The effigy of Charles II. stood for two centuries over his tomb in the south aisle of the Henry VIII. Chapel, and formed his only monument. The words which will be noticed across the picture were written on the glass by the diamonds of admirers, and if this is any proof of popularity, the "Merry Monarch" retains his winning ways even as a wax figure. The most dignified figure is that of the Duke of Buckingham, which is recumbent. This is Edmund Sheffield, the last Duke of Buckingham, who died in Rome in 1735.

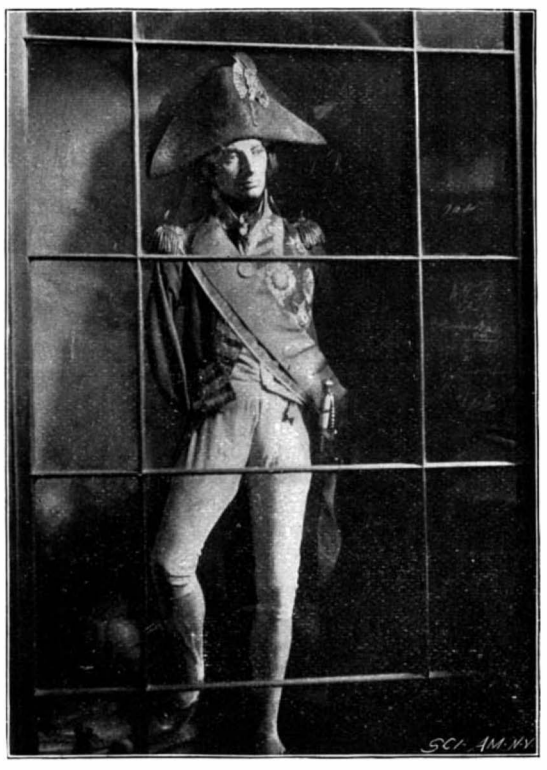
Duke of Buckingham.

Nelson's effigy is said to have been taken from a smaller figure for which he sat, and the clothes, excepting the coat, were those which he actually wore, and when Maclise painted the "Death of Nelson," he borrowed it to copy. It is a curious fact that he found the eyepatch still attached to the inner lining and the stamp always found in old hats of that period in the crown. The makers were obliged to put it in to show that the "hat tax" had been paid. The face is pale and worn and has a sweet expression. On the left breast are a galaxy of stars and the right sleeve of the coat is armless. The burial of Nelson in 1805 in St. Paul's Cathedral drew such crowds of people there and away from the Abbey that, as a counter attraction, the Admiral's effigy was made and set up among the wax works, with the result that the crowds returned to Westminster. This was certainly very discreditable to the Abbey officials. Still, however, Nelson seems to have looked forward to a grave in the Abbey; for, at the battle of Cape St. Vincent, in 1797, he headed his men as they boarded the "San Josef" with the cry, "Westminster Abbey or glorious victory!"

Among the other effigies which are displayed are Queen Anne; William and Mary; Catherine, Duchess of Buckinghamshire; Frances, Duchess of Richmond; the Earl of Chatham; and General Monk. Our engravings are made from photographs taken by H. C. Shelley and originally published in Black and White.

Queen Elizabeth.

King Charles II.



Admiral Nelson.

WAXEN EFFIGIES IN WESTMINSTER ABBEY.

Nuts as a Diet.

Physicians in different parts of Europe have been experimenting as to the nutritive and medicinal qualities of all kinds of nuts, and in some cases have advanced views favoring the use of nuts as food under certain conditions for special diseases. It is said that nuts contain a special kind of salt especially adapted for lubricating or softening the muscles of the arteries. Some physicians claim that elderly people especially would be benefited by a more extensive nut diet. The only evil to be overcome is that the nuts are difficult of mastication, which process must be thoroughly performed, so that no hard pieces may enter the digestive organs.

In France the absence of Indian corn as an article of diet among the poorer classes is to a certain extent replaced by the popular chestnut. The peasants of that country eat walnuts with bread that has been smeared with garlic, of which diet the hygienic effects are considered good, replacing meat in a large measure. They also make bread of chestnuts. After blanching the nuts, they are dried and ground into a kind of flour from which a sweet heavy flat cake, resembling the oaten cakes so popular among the Scotch peasants, is made.

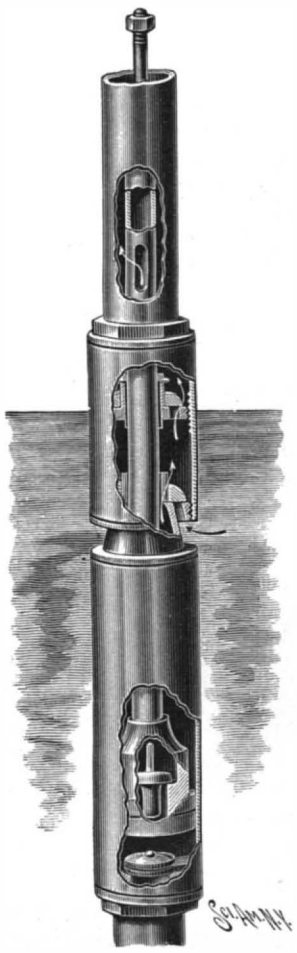
The pine nut of Korea, which is very rich in oil, is supposed to be strengthening, for which reason it, as well as the chestnut, is given to Korean children of weakly condition. The Koreans have also a nut that resembles in appearance our beech nut, having a white shell. It is called "uhn hang," which is translated in the dictionaries as Salisburia adiantifolia, or gingko nut. This is roasted and used for food, and is also very largely used in its raw condition as a remedy for coughs.—The Medical Herald.

THE atmosphere of London is particularly bad for statuary. It covers everything with a layer of black, and even corrodes stone. This was recently noted on St. Paul's Cathedral, where the heroic statues of the Apostles on the coping are in a very bad state of decay. A close examination reveals the fact that they are pitted as if eaten by worms, and three of them were in such bad condition that they had to be firmly clamped and braced to prevent them from falling to the street.

A NEW DOUBLE-ACTING PUMP.

An efficient double-acting pump has been invented and patented by Mathias L. Koogler, of De Graff, Ohio, which presents various novel features of construction, chief among which is the ready accessibility to all working parts.

The pump-barrel is made in two sections, which are joined together by a suitable connection, and which communicate with each other. The lower barrel-section is provided at its lower end with a valve controlling the admission of water to the barrel. The connection between the two barrel-sections carries a joint ring having orifices communicating with the exterior; these orifices are commanded by a valve seated on the joint ring. Above the joint-ring valve a check-valve is mounted on an adjustable gland.



KOOGLER'S DOUBLE-ACTING PUMP.

The pump-rod is hollow and extends longitudinally through the barrel-sections. At its lower end the rod carries a plunger provided with a valve controlling the admission of water. At its upper end the rod is formed with apertures opening into a conduit pipe secured on the upper barrel-section.

In operation the pump is so placed within the water to be raised that the valve on the joint-ring will be below the surface of the water. On the up-stroke of the pump-rod, the plunger valve will be closed and the valve in the lower barrel-section opened, thereby drawing water into the pump-barrel. The subsequent down-stroke of the rod will open the plunger-valve and close the barrel-valve, thus causing the water to be forced through the plunger-valve into the rod. After one or two reciprocations the rod will be filled, and the water discharged into the conduit pipe through the apertures in the upper portion of the rod. The down-stroke of the rod will produce a partial vacuum in the barrel-sections, thus causing the valve on the joint-ring to be lifted and drawing water down into the lower barrel-section. The next up-stroke will close the joint-ring valve and open the check-valve, to force the water out, the check-valve being closed on the next down-stroke of the rod. A continuation of the operation will cause a large amount of water to be elevated in a short time.

Poisonous Clothing.

A number of laborers employed on the street cleaning force of Birmingham, England, were provided with new overalls and overcoats. The men were employed one day in cleaning away snow, and some seventy of them began to experience a severe itching of the skin and a general irritation, and this outbreak was soon traced to the clothing, says The Druggist Circular. Owing to its deliquescent nature, chloride of zinc is not a substance one would expect to find used as a filler of clothing, but it was found that the fabric contained a liberal amount of this salt, and on account of moisture present in the air on the day referred to, it was freely dissolved, for the solution had reached the skin. About one-half of those who were made ill by the clothing soon recovered, but the remainder received injuries of a very painful character. It has also been found that a sample of flannelette was examined and it was found to be loaded with zinc chloride.

Discoveries About Jupiter.

Prof. George W. Hough, astronomer at the Dearborn Observatory, Evanston, Ill., has made public a new discovery in regard to the surface rotation of the planet Jupiter which is at variance with existing beliefs. It is the general tenet of astronomers that the surface rotation of the planet Jupiter is similar to that of the sun, being quickest near the equator and slowest in the higher latitudes near the poles. Prof. Hough, basing his observations over a period of twenty years, announces his belief that the surface of the planet Jupiter rotates upon its axis in separate envelopes or strata. He has further discovered, by a long series of observations, that the spots shift in longitude as well as having a rotary movement, and this also supports the ring or strata theory, evidencing the great instability of the surface, and strengthening Prof. Hough's belief of many years, that Jupiter is in a gaseous or plastic state.

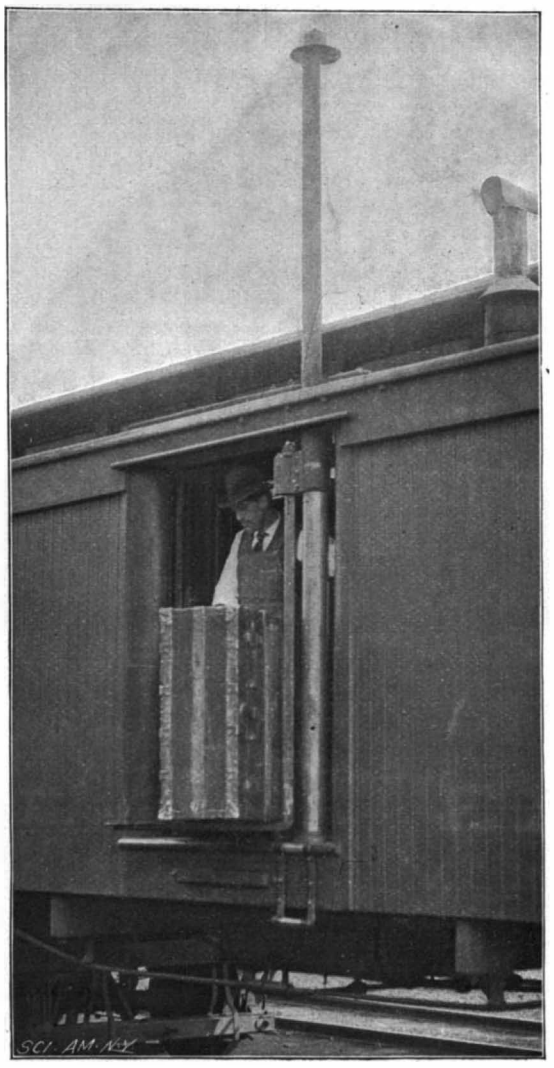
Hotel Accommodation in Porto Rico.

United States Consul Hanna, of San Juan, Porto Rico, is constantly in receipt of letters from citizens from all parts of the United States, regarding hotels and hotel accommodations in Porto Rico. He concludes from these letters that many people have their eyes turned toward Porto Rico as a desirable winter resort. He feels compelled to state that hotel accommodation is quite limited and that accommodations are far from first-class. The hotels are few in number and are generally run on the Spanish plan. The hotel rooms are, as a rule, small, plainly furnished, and are generally lighted from the inside courtyard, with no outside windows, and only a few rooms in each hotel front on the street. The cuisine is usually in Spanish style. The present rates are moderate. Before the Americans went to the island, family boarding houses were unknown, but now they are springing up in all parts of the island. Some of them have American cooks and claim to serve their meals in American style. Porto Rico is in need of some good American hotels, and doubtless they will be built as soon as the heavy duty is removed from American building material.

The winter climate of the island is delightful and, combined with the tropical scenery and healthy location, the new possession of the United States cannot fail to become a most attractive winter resort, if good hotel accommodations are provided, and doubtless this will come in a short time.

A PNEUMATIC BAGGAGE HANDLER.

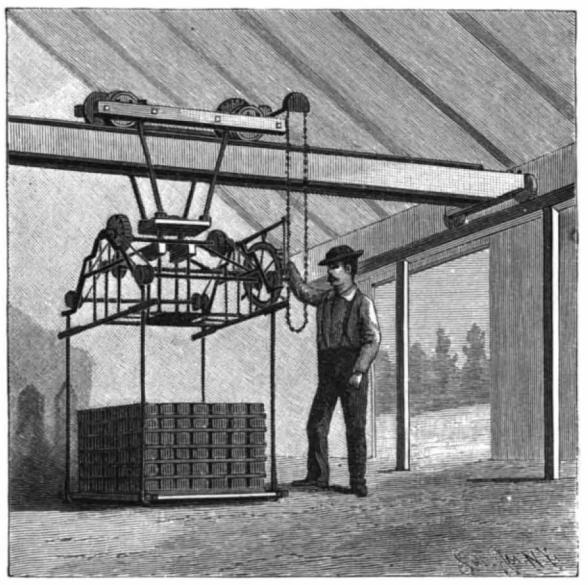
When we see heavy trunks by the truckload brought up to the side doors of baggage cars, and the hurried work of transferring them begun, we have often wondered why practical mechanical devices had not been invented to facilitate this transfer. Baggagemen in this country have attained an unenviable reputation as destroyers of trunks, but after all it may be questioned if they are so much to blame, when we consider the enormous weight and size of some trunks of the so-called "Saratoga" order. The device which we illustrate is of considerable general interest, and would certainly do away with the evils of baggage smashing, and, of course, heavy baggage could be handled much more rapidly by means of this device than by hand. The device consists of a hoist which can be thrown into action from the door of the baggage car. It consists of a hoist operated by compressed air which is drawn from the trainline to a special reservoir, and is handled by train baggagemen by means of suitable cocks on the inside of the car; it has a lifting capacity of 500 pounds and is operated with an air pressure of 70 pounds to the square inch. Our engraving represents a 218 pound trunk being raised by it. An auxiliary spring scale device is located at about the center of the vertical length of the baggage support. This provides for weighing the baggage as it is handled. The device is in use on the Grand Rapids and Indiana Railway, and we are indebted to the inventor, M. G. H. Wall, of Cadillac, Michigan, for our photograph and the foregoing particulars.



A PNEUMATIC BAGGAGE HANDLER.

A NOVEL METHOD OF CONVEYING FREIGHT.

The device illustrated in the annexed engraving is a freight-conveyer which may be readily operated by a single man to transport loads from one place to another, and which is especially designed to be used in connection with the handling of building material, in brick and stone yards. The conveyer consists of a traveling crane carrying a truck, from which the freight-transporting devices are suspended. One wheel-shaft of the truck is provided with a gear-wheel meshing with a pinion on a shaft projecting from the truck, and carrying a wheel about which there passes an endless chain. By pulling upon the chain, the truck can be moved to any point upon the crane. On the truck a frame is hung by means of a swivel-connection



A NOVEL METHOD OF CONVEYING FREIGHT.

or vertical pivot, and upon this frame, inclined tracks are arranged. Rollers provided with carrying-rods run upon these tracks, the carrying-rods being formed with hooks at their lower ends, to sustain the freight which is to be transported. Upon the frame a windlass is mounted. Cables surround the windlass and pass about the rollers of the carrying-rods. By means of the cables and the windlass, the rollers are caused to travel up and down the inclined tracks. The windlass is operated by a handwheel through the medium of gearing, and is provided with a brake whereby the load may be gradually lowered. When the handwheel of the windlass is operated, the cables will be wound up; the rollers will run up the inclined tracks; and the carrying-rods will elevate the load. By pulling upon the endless chain previously mentioned, the truck will be moved to the desired position upon the crane. When the crane has carried the freight-conveyer to the desired spot, the load can be gently deposited by means of the windlass and brake. The device is not limited to any special purpose, but is adapted for use in any place where large quantities of material are to be handled. The inventor of the conveyer is Mr Michael Butler, of Austin, Tex.

The "Reina Mercedes" Floated.

The "Reina Mercedes," which was sunk in the channel of Santiago Harbor during the bombardment of Santiago by Admiral Sampson's fleet on June 6, 1898, has been raised and pumped out, the government tugs assisting the wrecking company. She was brought to Santiago on the afternoon of March 2. Such repairs as can be readily effected will be made at that city, and she will then probably be towed to Havana. Final orders for her movements have not as yet been received.

The "Reina Mercedes" is a steel cruiser of 3,000 tons displacement; she was built in Cartagena in 1887; she is 278 feet 10 inches long; beam, 42 feet 7 inches; draws 16 feet 5 inches of water; her engines are 3,700 indicated horse power. Prior to the bombardment her boilers had given out and were practically useless. Of late years the "Reina Mercedes" was used as a transport. She had no protective deck and her armament consists of six 6·2-inch Hontoria guns; two 2·7-inch Hontoria guns; three 6-pounder quick-firing guns; two 4-pounder quick-firing guns; six 3-pounder quick-firing guns; two machine guns and four torpedo tubes.

The Care of Children in German Schools.

A resolution has just been passed by the City Council of Wurtzberg, Bavaria, which is worthy of emulation. According to this resolution, the teeth of poor pupils of public schools of the city are to be examined and cared for free of cost, provided their parents give their consent. It is intended to treat diseases of the ear and throat in a like manner, should the first experiment prove successful. It is probable that with slight expense the teeth of the children may be attended to so that if the latter live they will not suffer from dyspepsia owing to improper mastication.

THE MAREORAMA.

One of the attractions of the Paris Exposition of 1900 will be M. Hugo d'Alesi's "Mareorama," the principal feature of which will consist of a large ocean steamer, the passengers upon which will have an opportunity of making a voyage from Marseilles to Constantinople; that is to say, an imaginary voyage, since the vessel will not move forward at all, the illusion of sailing being produced by an arrangement that has already been employed upon the spectacular stage. The vessel will be mounted upon a spherical pivot, and the only motions that it will have will be those of pitching and rolling, which will be given it through the maneuvering of four pistons. It will be surrounded with genuine boiling and foaming water; and in the ventilators will be placed seawrack and algæ, traversed by a current of air that will become impregnated with marine odors.

The spectators, or the passengers rather, will walk about at their pleasure or sit at ease in rocking chairs upon the deck, which will reproduce that of a genuine steamer with the minutest accuracy, with all the details of masts, rigging, smoking and vibrating funnel, and a crew executing various maneuvers at the command of an experienced captain. At the same time, to the starboard and port of the vessel will unroll canvases fifty feet in height, painted with all the perfection that might be expected from the brush of M. d'Alesi, and representing the port of Marseilles flying to the rear, Frioul, Chateau d'If and fishermen's boats, and then the high seas and the Algerian and Tunisian coasts toward which the vessel will be apparently steering. Over half a mile of canvas will unfold all the sites and episodes of this picturesque voyage. Everyone is acquainted with the phenomenon; the displacement of an object which occupies the entire field of vision gives the stationary spectator the impression that he himself is moving. Thus, when we sit in a motionless train and another train rushes past us, it seems to us that it is our own train that is beginning to move.

"My Mareorama," says M. d'Alesi, "is based upon an analogous illusion. I shall keep up this simulation of a voyage by sea by every means possible. It is my intention to change my canvases after the Exposition is over, and we shall then, perhaps, make a trip to the North Pole."

The Palace of the Mareorama, constructed after the plans of M. Lacau, will be situated on the Champs de Mars, between the Eiffel Tower and the Monlineaux Station. It will be 131 feet in length, 112 feet in width, and 75 feet in height. An immense terrace, covering the entire structure and converted into a hanging garden, will crown the palace. This terrace will be reached through two wide stairways and two large elevators.

For the above particulars and the illustration we are indebted to the Revue International des Expositions de 1900.

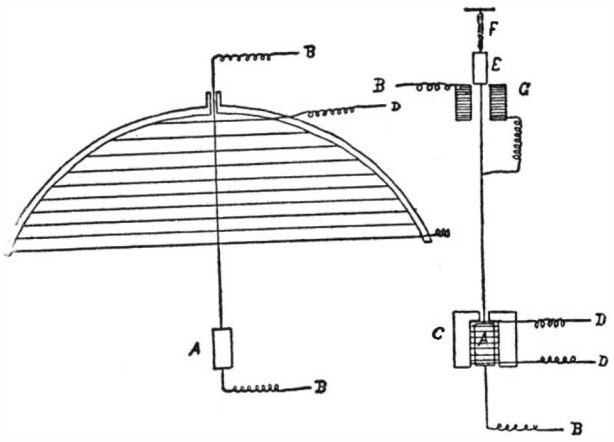
A Children's Museum.

Brooklyn is to have a children's museum similar to those which have been established in St. Petersburg, Vienna, Berlin, Paris, and other European cities. The new Brooklyn Museum will be the first of its kind in this country. The suggestion emanates from Prof. W. H. Goodyear, the Curator of Fine Arts of the Brooklyn Museum, and the trustees of the Institute decided to equip the Bedford Park Museum for children. It will contain specimens and pictures illustrative of art and science. It will be rich in educational material relating to all departments of knowledge, and designed for children's use. Prof. Goodyear has suggested that the basis of the collection, or rather the initial purchase, should be the Musée Scolaire, published in Paris, which consists of over one hundred colored cartoons, each cartoon displaying a combination of specimens wired to the pasteboard, colored designs and text. In this way the making of such substances as glass, paper, cloth, bronze, etc., is illustrated, each cartoon of the series having the materials, processes, and stages of manufacture shown by natural specimens and colored pictures. This was practically what was done a few years ago in the technical museum of the Pratt Institute. Unfortunately, the collection in that museum, which was excellent, had been dispersed, most of the specimens being sent to other departments in the Institute, where, of course, the main idea of the technical museum is entirely lost sight of, so it will be gratifying if Brooklyn will, at last, have a technical museum.

Specimens illustrating zoology, botany, geology, etc., will be added to the new children's museum, and the result will be a complete museum of material for object teaching, the value of which lies in its systematic balance and comprehensive character. If there is a strict regulation prohibiting the acquisition or exhibition of isolated specimens and of incomplete and mixed collections, the result cannot fail to be most gratifying. The collection will be carefully labeled, so that catalogues will be unnecessary, and a competent person will be in charge to explain and help the young visitors. The building is to be repaired and put in order at once for the reception of exhibits, and it will probably be several months before it will be ready for exhibition. The new museum will also serve as a model for schoolroom decoration.

THE NERNST LIGHT.

The Nernst electric light is creating great interest abroad, and the paper of James Swinburne before the Society of Arts, of London, ends with the following sentences: "I feel that I have but feebly shown forth the probable future of what seems to me to be the greatest invention in electric lighting that we have seen for many years. Still, I am sure that I have not been too sanguine." We have already referred to this lamp, and in the current SUPPLEMENT we publish Mr. Swinburne's original paper, as presented before the Society.

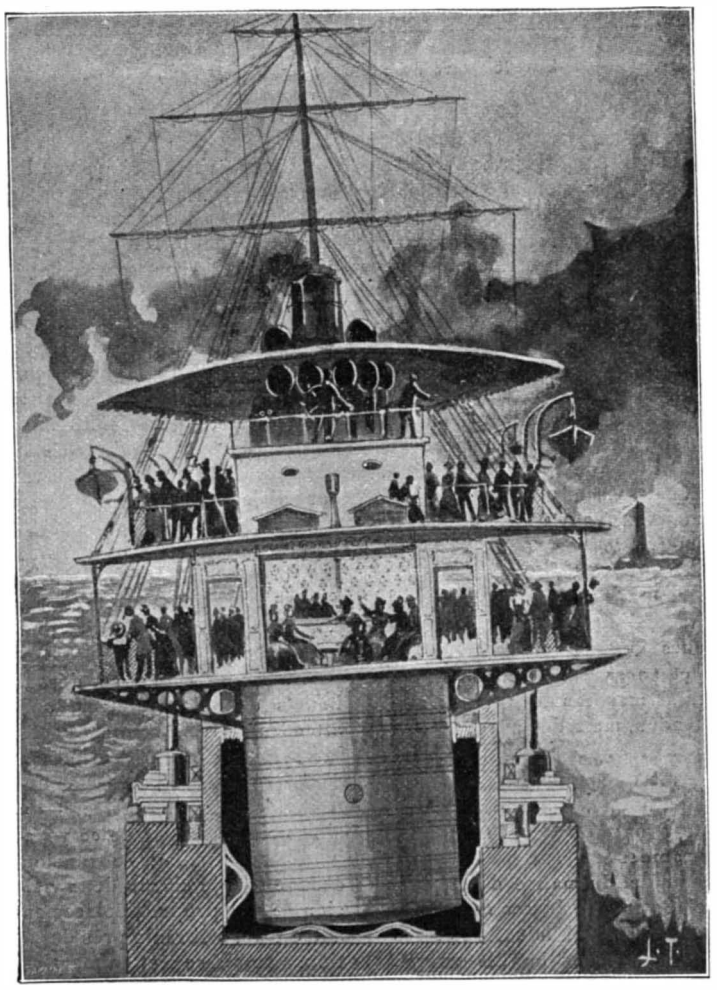


PROF. NERNST'S APPARATUS.

Prof. Nernst has achieved a wonderful result by the very simple means of rendering an insulator a conductor by heating it. The knowledge that an insulator could be made to conduct electricity by heating it was known some twenty-three years ago, but apparently no one thought of the simple expedient of heating a very good insulator, then applying a current of suitable potential, and thus obtaining a brilliant light. The result is clearly of great commercial importance, aside from its being interesting from the purely scientific side.

The Nernst light appears to have very practical advantages. It can be made to run singly on a pressure of from 500 to 1,000 volts, and any lamp which can be worked with voltages higher than those possible with the present glow lamp must bring about great economy in electric supply. It does not require a thin glass bell and a vacuum, and thus we get rid of a very serious difficulty, because these bulbs are very fragile and are easily destroyed. In the ordinary incandescent lamp many of them are defective, owing, not to a fault in the filament, but to an imperfect vacuum. Of course, a lamp of the Nernst type would not need regulating machinery and no trimming would be necessary, and on this account it would appear that an ideal form of street lighting has, at last, been found. The possibilities of the carbon filament are about exhausted. There has been little improvement for a long time, and it is a remarkable thing that just when the carbon filament was failing to meet the requirements this new invention should be made, which seems to meet the case. It is very like the discovery of gutta percha at the critical period, which brought electrical cable makers out of their difficulties. As yet the Nernst lamp is in an experimental stage, and it is possible that in time some of the features which militate against its success will be modified. At present the conducting and light-emitting rod when cold is an insulator and must be heated with a match or by some electrical means. While the Nernst lamp is far from being a commercial success as yet, still it is also far from being only the impractical scheme of an inventor. The lamp is based upon sound scientific principles which appeal at once to practical electricians, who have been extraordinarily quick in this instance to see the wonderful potentialities of the lamp.

The operation of Prof. Nernst's apparatus is as follows: The preliminary heating of the magnesia, *A*, the professor accomplishes by placing it in the focus of a reflector, *C*, see left figure. On the inner side of the reflector is a spiral wire of platinum, *D*, which when brought to incandescence by a current produces heat sufficient to render the magnesia a conductor; a current is then passed directly through the oxide by the wire, *B*, and that in the spiral is shut off. A complicated form of lamp is seen in right figure. Here the magnesia, *A*, is placed within a cylinder, *C*, which also incloses a platinum spiral, *D*. As soon as the incandescent spiral has heated the magnesia sufficiently, a current is passed through the oxide by the wire, *B*. Within this circuit is a coil, *G*, which, upon becoming magnetic, draws down the iron bar, *E*, thus lowering the now incandescent magnesia from within the cylinder. Upon breaking the circuit the coil loses its magnetism, and a spring, *F*, raises the iron bar and the magnesia to their former position.



THE MAREORAMA.

San Pedro Breakwater.

Work on the great San Pedro breakwater, which is to inclose a harbor of refuge on the lower coast of California, has begun. An appropriation of $2,900,000, of which $400,000 is available for each year, has been made by the government, and now this colossal undertaking will be pushed to completion. The plan adopted by the government contemplates a detached breakwater 8,500 feet in length, with two arms of 3,000 and 3,700 feet, connected with a curve of 1,910 feet radius, 1,800 feet long. The shore end begins 2,100 feet from land, in 3½ fathoms, gradually deepening to 8½ fathoms at the west extremity. The breakwater will consist of a random stone substructure surmounted by a structure of more regularly shaped rock roughly placed, carried to a height of 14 feet above mean low water. The superstructure is to be protected at both ends by a block of concrete 40 feet square, carried 20 feet above mean low water. The substructure rests on a base 90 feet wide, and finished 38 feet wide at mean low water, and will have a slope of 1 to 2 horizontal to 1 vertical, the whole height inside. For the 12 feet above the plane of rest on the ocean side the slope is 3 horizontal to 1 vertical. The breakwater will be 20 feet wide at the top. The estimated quantity of material that will be consumed in this structure is 1,781,998 cubic yards of rock of all kinds and 64,000 cubic feet of concrete.

The rock will be obtained on San Clemente Island, 52 miles distant, where the contractors have already driven four tunnels from 50 to 30 feet in length, and built a protective breakwater allowing the barges to be loaded right at the face of the rock. A very large amount of machinery for derricks and other appliances has already been placed upon the island, and men are now at work getting out rock. Air compressors and drills have been ordered, and will soon be on the ground. About 3,000,000 feet of lumber will be required for building barges. Seventy-five men are employed now, but later this force will be much increased. Progress will be rapid as soon as the shipments of stone begin, as the sea at this part of the coast is rarely visited by severe storms. Work can be prosecuted throughout the year.

The new breakwater will afford the only safe and capacious harbor, with the exception of San Diego, between San Francisco and Mazatlan. E. BROWN.

San Francisco.

MR. G. A. SPOTTISWOODE died in London on February 8, 1899. He was the head of the great publishing house of Spottiswoode & Company, and was well known in religious and philanthropic circles.

Science Notes.

A writer in The Cincinnati Lancet claimed that he recently helped hold an autopsy on an old soldier who had been wounded in 1861, by irregular soldiers known generally as "bushwhackers." The wound was made by a small rifle ball of the kind used by muzzle-loading rifles. It had embedded itself in the wall of the heart, near the lower part of the left ventricle. There had not been any depression of the heart in any way, and it seemed to be perfectly normal. After the war the man served as a farm laborer for thirty-seven years. A cancer of the arm was the cause of his death.

A new process for coating iron and steel consists in the use of a bath consisting of zinc, tin, and aluminum. It is claimed that this produces a coating which is much superior to any now known, adhering so firmly that the sheet will stand working after it has been applied and will resist corrosion and can even be heated red hot without injuring it. The coating is applied in the same manner as in the well-known process of galvanizing, that is, by dipping galvanized sheets in the metal alloy. The most approved mixture is made by melting together 84 parts of zinc, 14 parts of tin, and 1½ parts of lead and 0·5 of a part of aluminum. The process is patented.

An International Veterinary Congress will be held at Baden, August 9–14, 1899. The subjects to be discussed include prophylactic measures to prevent the spread of cattle diseases by the export of animals; the treatment of tuberculosis in domestic animals; the use of the flesh and milk of animals affected by tuberculosis and requirements for the inspection of meat; the cure of foot and mouth diseases and diseases of swine; the dissemination of veterinary instruction, as well as the preparation of a uniform anatomical nomenclature in veterinary medicine and the cure of rabies, etc. The members of the congress will consist of delegates from foreign countries, as well as from the German empire, representatives of veterinary schools, public health officers, etc.

A curious case of the recovery of a woman who had been disemboweled by a cow is noted in The London Lancet. The woman, who was forty-two years of age, was tossed into the air, and it was found she was suffering with a severe abdominal wound through which twenty feet of small bowels protruded. The physicians washed the wound with a weak solution of carbolic acid, and the reduction was begun. Catgut sutures were introduced deeply, but not touching the peritoneum. It was thought at first that the patient would not survive the reduction, the shock having been so severe; but, fortunately, no hemorrhage or injury of the bowels had occurred, and when the reduction was complete and the wound had been sewed up, the woman expressed herself as feeling better. The after history of the case was most satisfactory, and in thirty-five days after the accident she was up, moving around doing light work.

The various departments of the city government of New York that have engineering work to do employ no less than one hundred and seventy-two civil engineers, at salaries which range all the way from $1,200 to $10,000 per annum. To assist these engineers a host of draughtsmen, surveyors, etc., are employed. The Commissioner of Sewers has a chief engineer and twenty-six assistant engineers; the Commissioner of Bridges has fifteen engineers; the Commissioner of Water Supply has twenty-seven engineers; the Commissioner of Public Buildings, Lighting and Supplies, has three engineers; the Dock Department, twelve; the Park Department has eleven engineers; the Board of Education, two; the Board of Public Improvements, twenty-five; the Commissioner of Highways, twenty-three engineers; Commissioners of Accounts, six engineers; Finance Department, six; the Chief Engineer of the Croton Aqueduct has fourteen assistant engineers under his orders. This is certainly a remarkable showing of professional talent for even a city of the size of New York.

An association called the "Cuban Educational Association of the United States of America" has been formed, with offices at 289 Fourth Avenue, New York city, N. Y. The object of the society is to assist in educating the Cubans and Porto Ricans in the United States. A large number of applicants from Cuba and Porto Rico have asked to be educated in the United States; but many of them are, unfortunately, deficient in the English language, and, besides, have not sufficient funds to enable them to obtain a course in the United States. A large number of educational institutions in this country have offered to receive and instruct these young men, without charge, so that only necessary living expenses have to be provided. To meet the emergency the association suggests that in each city and town which has an institution willing to receive one or two of these bright young men, there should be formed a committee who will stand sponsors for the board and incidental expenses for each young man, for one year of trial work at school. This is certainly a very interesting plan, and it is indorsed by such men as Major-Gen. Wheeler and Prof. Nicholas Murray Butler, of Columbia University.

Miscellaneous Notes and Receipts.

Waterproof Glue.—Besides with potassium chromate, glue may also be rendered impervious to water by admixture of linseed oil. The glue is first soaked in warm water and then melted at a moderate temperature in linseed oil, or else a liter of glue solution is simply mixed with 100 c. m. of linseed oil. In the latter case a slight addition of nitric acid is recommended to keep the mixture liquid. A little borax will protect the glue from putrefying.—Oesterreichisches Lederblatt.

To extinguish oils which have taken fire, the Illustrirte Gewerbe Zeitung recommends the use of a fine-meshed wire-net of the size of a boiling-pan, which should be kept on hand in every varnish factory, etc. In the same moment when the netting is laid upon the burning surface, the flame is extinguished because it is a glowing mass of gas, which the iron wire quickly cools off so much that it cannot glow any more. The use of water is excluded, and that of earth and sand undesirable, because both dirty the oil.

To Glue in Brass Ornaments.—The falling out of ornaments embedded in wood, where a visible screw is not desirable, is frequently very troublesome, and a renewed gluing in rarely obviates the evil, if it is omitted to dip the metal pieces previously in weak nitric acid for about half a minute. Such a bath, with subsequent drying, imparts a moderate roughness to the metallic surfaces, which makes the glue "seize" much better. The glue employed must be exceedingly viscous and never brittle. It is prepared as usual and receives a small addition—about a teaspoonful—of glycerine and as much of slaked lime. During the boiling the mixture should be stirred together intimately, so that the admixtures can properly combine with the glue. It should be applied hot on the slightly warmed pieces, which should be quickly pressed into the wood. The glue must not be thin, but sirup-like. Metal objects inlaid in this manner never drop out from the wood; they can only be torn out by force, on which occasion a thin layer of wood is carried along.—Zeitschrift für Drechsler, etc.

Treatment of Lime.—Lime ought to be, to the painter, a universal material, and yet many do not know how to handle it, and to use it in the proper place, says Ad. Körbler, in our Vienna contemporary, the Dekorateur. Lime is especially useful for façades, churches, gateways, open halls, and verandas and particularly on damp walls. In all these places size-paint would not be suitable as the size would quickly putrefy, owing to the influence of the changes of temperature and dampness, thus losing its binding power, while the permanency of the lime is enhanced by the action of the oxygen in the air. Especial durability is obtained by roughening old walls with coarse pumice stone before painting, subsequently washing off the walls or at least removing the dust. Peeling of a lime coating is due to too thick an application or to putting on a fresh coat before the first is dry.

In order to enhance the durability of the lime various binders may be added to it, as follows: If more earth colors are to be added to the lime than it is capable of binding, caseine size should be employed. The caseine is rubbed up, together with the milk-water, with unslaked lime and thinned with milk. In Switzerland lime slaked with caseine water is used, thinned with milk, and the durability is excellent. Frequently kitchen salt or rock salt is also added, but this is only advisable for white work, as the salt sometimes effloresces, and the colored coating shows white spots after a few weeks.

Varnish and linseed oil also contribute largely to increase the permanency of the lime, but it is best to add these binding agents during the slaking.

Blood is likewise a good binding material. It must be allowed to stand a few days, after hot water has been poured on it. Before use it has to be stirred up well and sifted. Besides, it is necessary to add, on account of the foul odor, 1 kilo. of boracic acid to every 100 kilos. of lime for disinfecting purposes.

Green vitriol imparts to lime a yellow color similar to ocher; copper sulphate in lime gives a handsome blue-green; green vitriol, copper sulphate, and lime give a nice sap-green; and to obtain a fine blue, take a sulphuric solution of cobalt. Such coatings adhere excellently to damp walls, as the substances admixed are much better than earth colors. At the same time they are much cheaper, for 1 kilo. of vitriol is sufficient for a room of considerable size.

All these chemical coloring substances are dissolved, if to be used at once, in hot water, but the solution can also be made with cold water if one waits a few hours. It still deserves mention that these vitriols are not injurious to the skin, the floor or the brushes, that they are not caustic and do not burn.

For smoky café ceilings it is well to force the thick soft soap together with thick lime, to dilute with water and to spread out rather compact. But green vitriol is also a good medium for such ceilings. Coat the ceiling previously with lime and green vitriol, let this dry thoroughly, and only then coat with strong soap. It will be found that green vitriol will appear olive green in the receptacle and draws together into a thick paste; this should not cause one any misgivings; it can, after all, be flowed on like thin paint, and turns a handsome ocher yellow.

By some experiments with the above chemicals in the employment of the quantity, the necessary experience in mixing and tinting will soon be acquired.

A Suitable Ration for the Tropics.

A ration for use by troops in the tropics must be non-irritating, easily transported, and, above all, easily preserved. The beef component and salt pork should be reduced one-half, farinaceous food being substituted therefor. Salt meats should not be issued more than once or twice a week, and if meat is needed, fresh meat should be supplied. Of cereals, hominy is the best, as the husks are removed in the process of manufacture. Equally valuable is rice, and the white bean of this country should not be issued, but instead the red bean commonly found in the tropics, as it breaks up rapidly in cooking and is more digestible. These beans and hominy form the staple diet of the Mexican army. In addition to the above, apples and prunes should be added to the ration for the tropics.

The German soldier in the tropics, says Dr. L. L. Seaman, Major of the U. S. Volunteer Engineers, in a recent lecture before the New York Academy of Medicine, reported in The Medical Record, gets 5·33 ounces of fresh meat or 4·4 ounces of salt bacon, while he receives 79 ounces of vegetables, including potatoes. The Japanese soldier receives a ration of 36 ounces of rice and an allowance of about 6 cents for his meats, tea, etc.

The Surgeon-General's commission, which has just returned from the tropics, insisted that no improvement could be made in the diet of our soldiers. At present the daily ration of the soldier in the United States army consists of fresh meat, 20 ounces; or salt beef, 22 ounces; or pork or beef, 12 ounces; bread or flour, 18 ounces; potatoes, 16 ounces; peas or beans, 2·40 ounces; or tinned tomatoes, 5·33 ounces; rice, 1·60 ounces; sugar, 2·40 ounces; coffee, 1·60 ounces; salt, 0·25 of an ounce. The travel ration was made up as follows: Hard tack, 1 pound; beef, canned, 0·75 of a pound; baked beans, 0·33 of a pound; sugar, 1·5 pounds. The ration, as given, was the ration for soldiers in Alaska through the winter of a year ago, and was essentially the same as was issued to the army in Cuba. It is estimated that one-sixth of the total income of food is expended on mechanical force and five-sixths for the production of heat.

The general experience of inhabitants of warm climates was in favor of a diet which was chiefly vegetable. This offers a sufficient supply of albuminoids without giving an unnecessary amount of heat-producing ingredients. Dr. Seaman argues that the food products of each one would be found to be peculiarly well adapted for those particular regions. The natural appetite instinctively inclines one to eat those articles of diet best suited to the particular zone in which one happens to be.

The ration of the British soldier in India has a meat component which is less by from 4 to 6 ounces than in the United States ration, and the rice was greater by 4·2 ounces; but even so, the British ration has been criticised chiefly on the ground that it was too liberal, as it was well known that a moderate quantity of food was most desirable in the tropics.

Central Africa Volcanoes.

Captain Benthe, of the German army, has just returned from his ascent of Mount Kirunga. The active volcano is north of Lake Tanganyika, and is over 12,000 feet in height. He was the second to climb the crater—a most difficult undertaking, which occupied two days. Count von Götzen, who discovered the mountain, found that lava was bubbling up through places in the bottom of the crater. Captain Benthe found that the crater was full of water, which indicates that for some time the volcano has not been in a state of eruption. All the surrounding regions are covered with lava, and many natives live in small natural caverns roofed over by sheets of lava. According to The New York Sun, the explorer discovered nine new lakes in this volcanic region. On the whole, Africa has remarkable immunity from subterranean disturbances of all kinds. The only part of the continent which is known to be subject to earthquakes is the region of the Atlas Mountains, in Morocco, which occasionally share the disturbances which now and then cause considerable destruction in the neighboring Iberian peninsula.

A Serum Cure for Pneumonia.

One of Prof. Koch's pupils, Prof. Wasserman, thinks that he has discovered a serum cure for pneumonia. According to a cable dispatch to The New York Sun, he does not commit himself to a definite statement, as he is mindful of former disappointments which advanced experimentalists have suffered, but prolonged experiments with rabbits and mice have convinced him that an anti-toxin is produced in the red marrow of their bones and in the marrow of human beings who have died from pneumonia.

NAVIES OF THE WORLD.

IV.—RUSSIA.

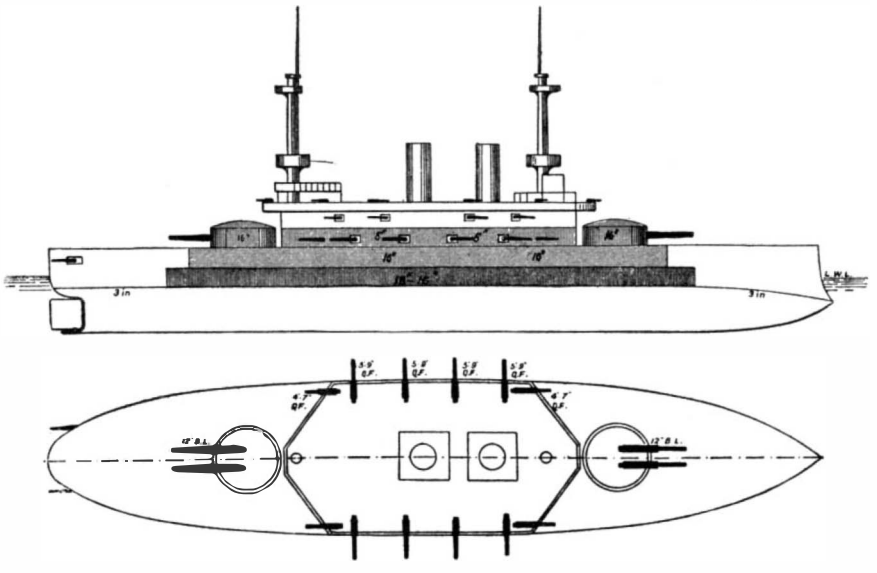
So extraordinarily rapid is the growth of the world's navies under the spur of feverish competition, that it is almost impossible to name the exact strength of each navy at any particular period of time. The present series of articles are based upon the actual number of ships built, building, or of which the keel was laid down on January 1, 1899. To secure this data, not to mention the copious illustrations, has been a work entailing no little correspondence and research; but our readers may rest satisfied that the comparisons as given in the general article of December 31 and amplified in the special articles treating of the separate navies are correct.

The tables of comparative strength show that on the opening day of the present year the effective and up-to-date vessels of the Russian navy numbered 86, with a total tonnage of 453,899 tons, divided as follows: Battleships, 23 of 250,891 total tonnage; coast defense vessels, 14 of 40,810 tons; armored cruisers, 11 of 90,432 tons; protected cruisers, 6 of 31,766 tons; small cruisers and gunboats, 32 of 40,000 tons.

The most striking feature in the Russian navy is the fact that more than half of its ships in numbers and 84 per cent in displacement consists of armored vessels in the shape of battleships, coast defense vessels, and armored cruisers. Out of a total of about 454,000 tons, only about 72,000 tons consists of unarmored ships. Furthermore, it should be noted that the Russians, like ourselves, have shown a fondness for extremely heavy batteries, the armament of such vessels as the battleship "Tri Sviatételia" and the armored cruiser "Rossia" consisting of batteries which surpass anything under construction, unless it be our own "Maine."

BATTLESHIPS.—In battleships of the first class Russia is exceptionally strong, having 17 excellent ships, none of which is over 10 years old. This is just one-half as many battleships of this class as are built or building for the British navy, whose total tonnage is nearly four times as great as that of Russia; while France, whose tonnage is two-thirds greater than that of Russia, has only 14 battleships in the "10 year old or less" class.

The latest and best of these vessels is represented by the new battleship "Retwisan," now building for Russia at the Cramps' shipyard, Philadelphia, and illustrated in the SCIENTIFIC AMERICAN of November 5, 1898. Five of these ships are being built, the other four being under way in France and Russia. The particulars of the American-built vessel are as follows: Displacement, 12,700 tons; speed, 18 knots. Armor: Belt, 9 inches; upper belt, 6 inches; deck, 2 inches on flat, 4 inches on slopes. Armament: Four 12-inch B. L. rifles; twelve 6-inch, twenty 3-inch, and twenty-eight smaller rapid-fire guns. The battery is carried on the main and gun decks and is well distributed, care being taken to avoid interference of fire. Eight of the 6-inch rapid-fire guns are carried in a central battery protected by 6-inch armor, on the gun deck. Forward of this battery on the same deck are eight 3-inch rapid-firers, while aft are four more. The main deck will be flush throughout, except where it is broken by the amidship superstructure. The 12-inch rifles will be carried in two elliptical turrets forward and aft of the superstructure. Within the superstructure, one at each angle and protected by Krupp armor, will be four 6-inch rapid-fire guns, while between them in broadside will be six of the 3-inch rapid-firers. On the superstructure deck will be two 3-inch guns, one on each broadside. The other twenty-eight rapid-fire guns of small caliber will be scattered throughout the bridges, superstructure, and tops.



First-class Battleship "Tri Sviatételia." Also with modifications, the "Tavritchesky."

Displacement, 12,480 tons. **Speed,** 18 knots. **Normal Coal Supply,** 1,000 tons. **Armor:** Belt, 18 inches; gun positions, 16 inches; deck, 3 inches. **Armament,** four 12-inch B. L., eight 5·9-inch rapid-fire, four 4·7-inch rapid-fire, fifty-six small rapid-fire pieces. **Torpedo Tubes,** 6. **Complement,** 582. **Date,** 1893.
Five ships are building of the "Peresviet" type. These are improved "Tri Sviatetellas," of 12,674 tons and 18 knots, with 9½-inch belts and armed with four 12- or 10-inch B. L. guns, eleven 6-inch rapid-firers, sixteen 3-inch, ten 1·8-inch and seventeen 1·4-inch rapid-firers.

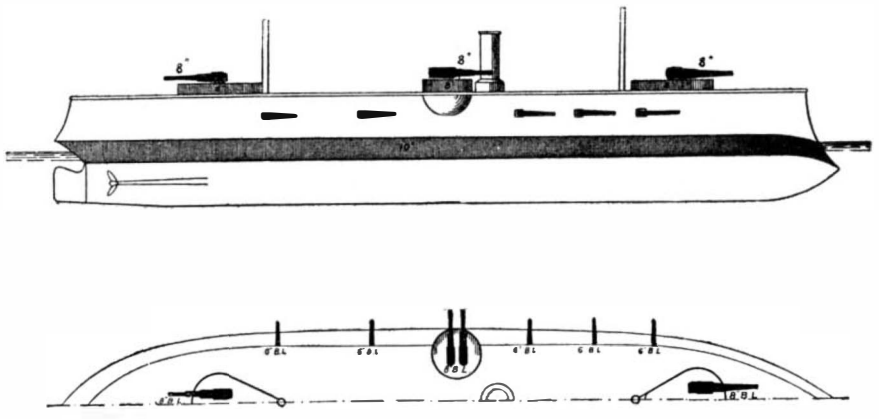
Preceding these five battleships in date of commencement are the battleships "Oslabya" and "Peresviet," the "Peresviet" forming the prototype for the whole five. They are being built on the Neva for the Baltic fleet, and the particulars are as follows: Displacement, 12,674 tons; speed, 18 knots; protection, a 9 to 7-inch belt, 9-inch barbettes, and a deck from 1¾ to 2¾ inches in thickness. The armament, though less powerful than that of the Cramp ship, is very effective, consisting of four 10-inch B. L. rifles, eleven 6-inch rapid-firers, sixteen 3-inch and twenty-nine smaller rapid-fire guns. The vessels will carry Belleville water-tube boilers and will be driven by triple screw engines. The maximum coal capacity is over 2,000 tons.

Of earlier date, and now building, are the battleships "Tavritchesky" and "Tri Sviatételia," of 12,480 tons and 18 knots speed. The latter vessel was launched in 1893 and is completed, while the former is still under construction. Both ships carry 12-inch guns as the main armament, while their heavy secondary or intermediate battery is made up of 6-inch, 4·7-inch, and 3-inch rapid-firers, as given under the diagrams on the accompanying page. The secondary battery of small guns is very powerful. The earlier ships carry fifty-six of these guns alone, or seventy guns in all. In the "Tri Sviatételia" the protection consists of 18 and 16-inch armor on the belt and barbettes, while in the "Tavritchesky" the use of face-hardened armor allows the thickness to be reduced to 9-inches on the belt and 10 inches on the barbettes.

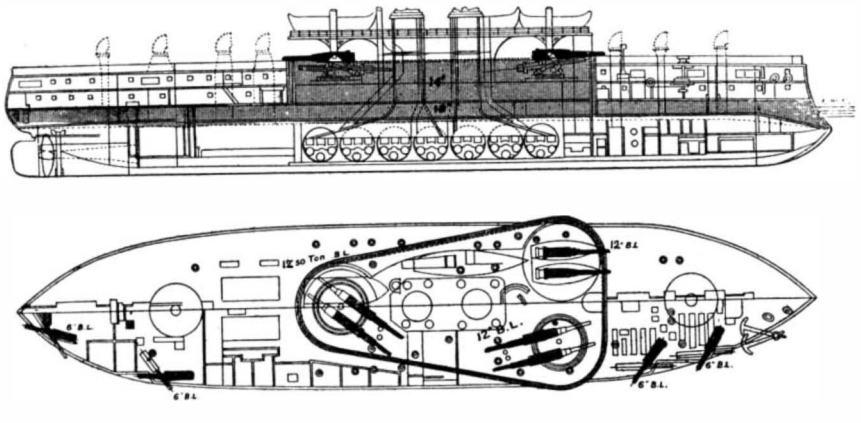
The battleships already mentioned are the pick of the Russian navy, and they will form a homogeneous fleet of nine practically identical ships of high speed, great size, and powerful armament, which will be the equal in fighting quality of any seven ships that could be brought against them. If they have a weak point, it is that the large crews carried must be badly crowded in ships so loaded with guns, and the weight of guns and crews, stores, and equipment must have necessitated a limited supply of ammunition. Thus the "Oslabya," of 12,674 tons and 732 men, carries about the same crew as the British "Formidable," of 15,000 tons and 750 men.

The next battleships preceding the "Tri Sviatételia" are the sister ships "Poltava," "Petropavlosk," and "Sevastopol," of 10,960 tons and 17·5 knots speed, the two former launched in 1894 and the latter in 1895. They are well protected, carrying 15¾-inch Harvey steel on the belt and 10 inches on the gun positions, while the deck is 3½ inches in thickness. The armament is heavy and is disposed, as far as the secondary battery is concerned, after the manner of that on the French "Jauréguiberry," in pairs in turrets. It consists of four 12-inch, twelve 6-inch, of which eight are in four turrets and four on the main deck mounted in casemates. There are twenty-four smaller guns. These three ships have easily maintained 17·5 knots on trial, and in every point of comparison they stand in the front rank as battleships.

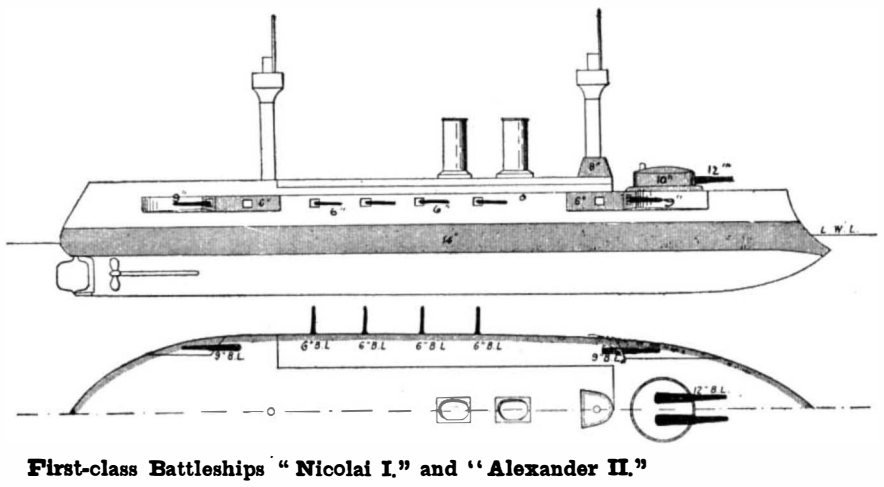
The two sister battleships, "Sissoi Veliky" (1894) and "Rostislav" (1896), and the "Twelve Apostles" (1890), are similar in size, speed, and offensive and defensive qualities. The two former are of 8,880 tons and 16 knots, carry 15¾-inch compound armor on belt and barbettes, and are armed, the "Veliky" with four 12-inch and six 6-inch rapid firers, and the "Rostislav" with four 10-inch and eight 5·9-inch rapid-firers, both carrying the large number of small rapid-firers characteristic of Russian ships. The "Twelve Apostles," of 8,076 tons and 16·6 knots, has 14-inch and 12-inch com-



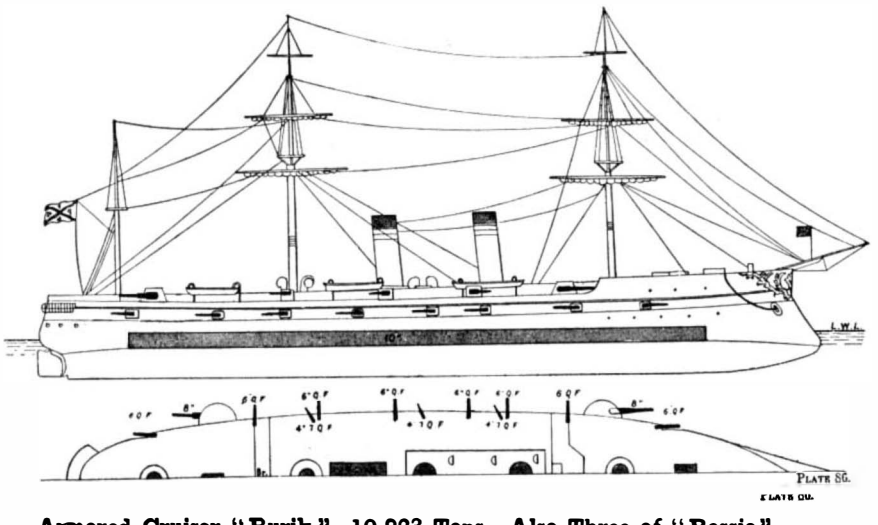
Armored Cruiser "Admiral Nakhimoff."



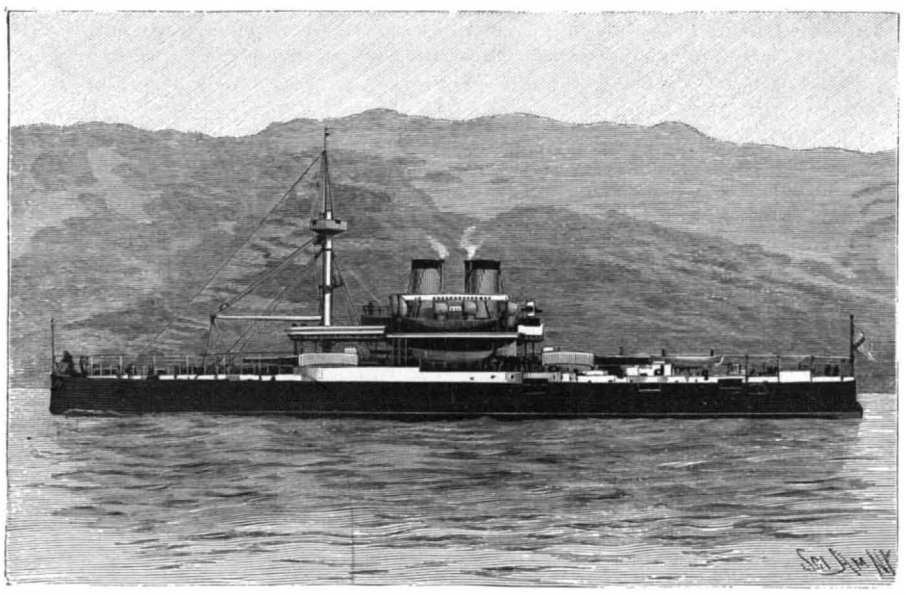
First-class Battleship "Tchesme." Class of Four Ships.



First-class Battleships "Nicolai I." and "Alexander II."

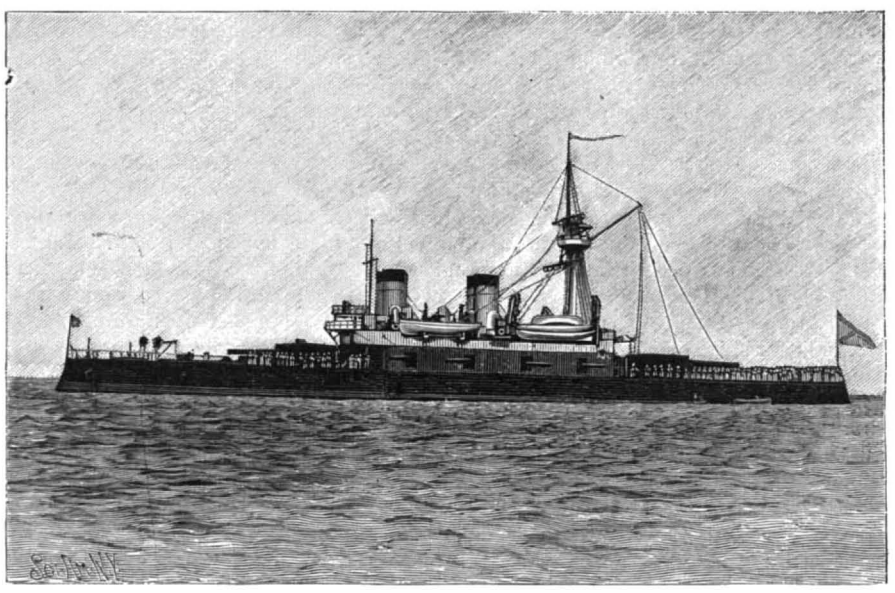


Armored Cruiser "Rurik," 10,923 Tons. Also Three of "Rossia" Class of over 12,000 Tons and 20 Knots.



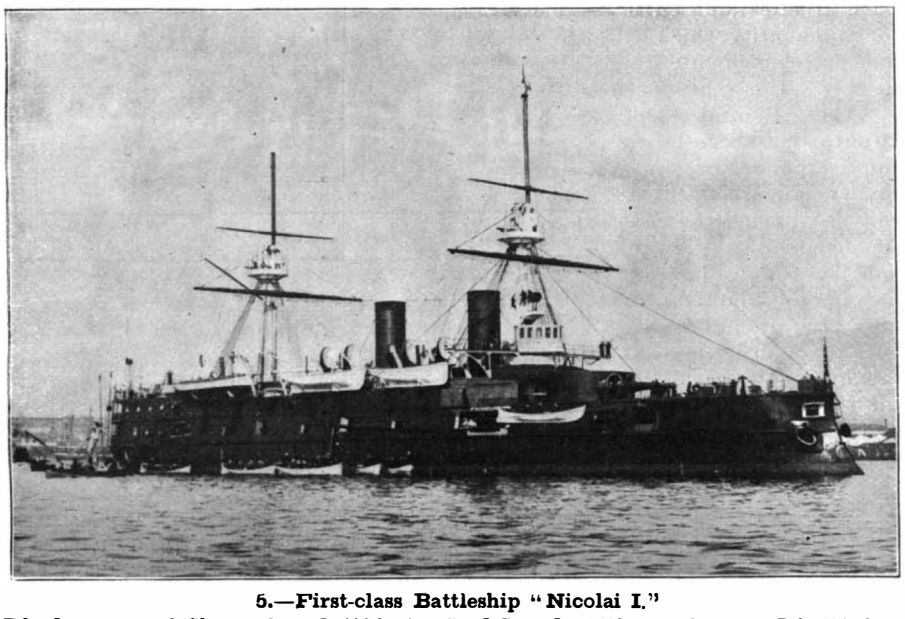
3.—First-class Battleship "Tchesme." "Sinope" Class of Four Ships.

Displacement, 10,180 tons. **Speed,** 15 knots. **Normal Coal Supply,** 886 tons. **Armor:** Belt, 16 inches; gun positions, 14 inches; deck, 3 inches. **Armament,** six 12-inch, seven 6-inch B. L rifles, eight small rapid-firers and six machine guns. **Torpedo Tubes,** 7. **Complement,** 325. **Date,** 1886.



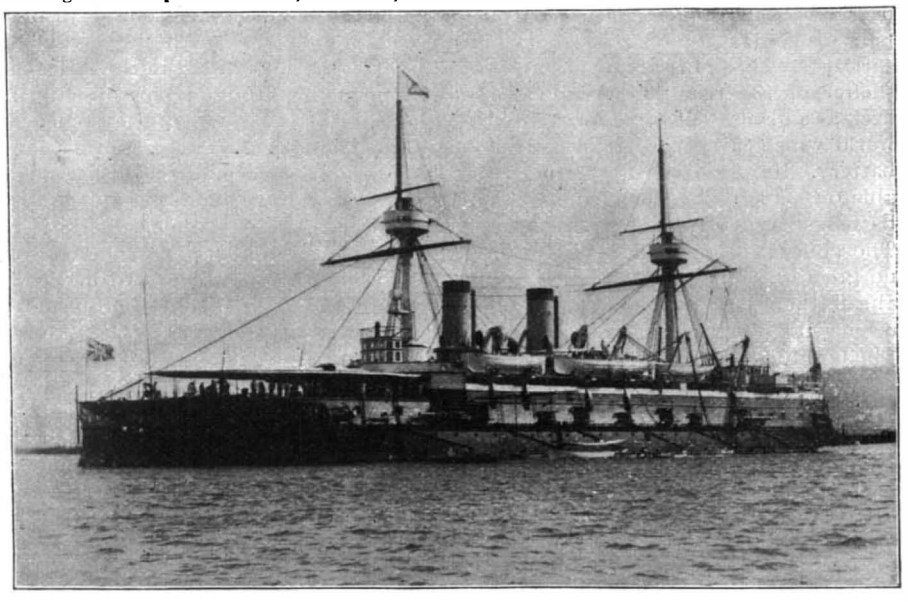
4.—First-class Battleship "Navarin."

Displacement, 10,206 tons. **Speed,** 16 knots. **Coal Supply,** 1,200 tons. **Armor:** Belt, 16 inches; gun positions, 12 inches; deck, 3 inches. **Armament,** four 12-inch, eight 6-inch, fourteen small rapid-fire guns. **Torpedo Tubes,** 6. **Date,** 1891.



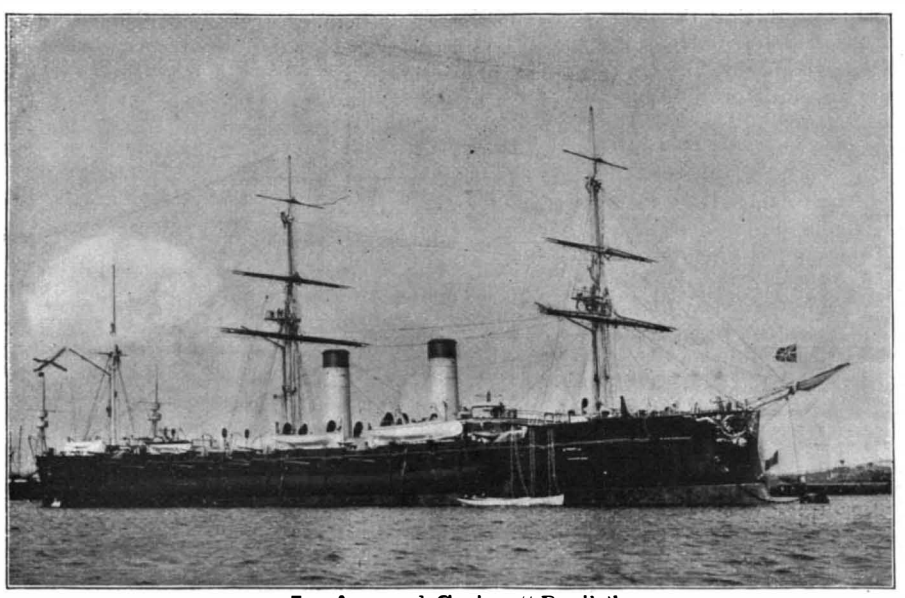
5.—First-class Battleship "Nicolai I."

Displacement, 9,672 tons. **Speed,** 14·8 knots. **Coal Supply,** 1,000 tons. **Armor:** Belt, 14 inches; gun positions, 10 inches; deck, 2½ inches. **Armament,** two 12-inch B. L. rifles, four 9-inch B. L. rifles, eight 6-inch rifles, twelve small rapid-fire guns, eight machine guns. **Torpedo Tubes,** 6. **Complement,** 604. **Date,** 1888.



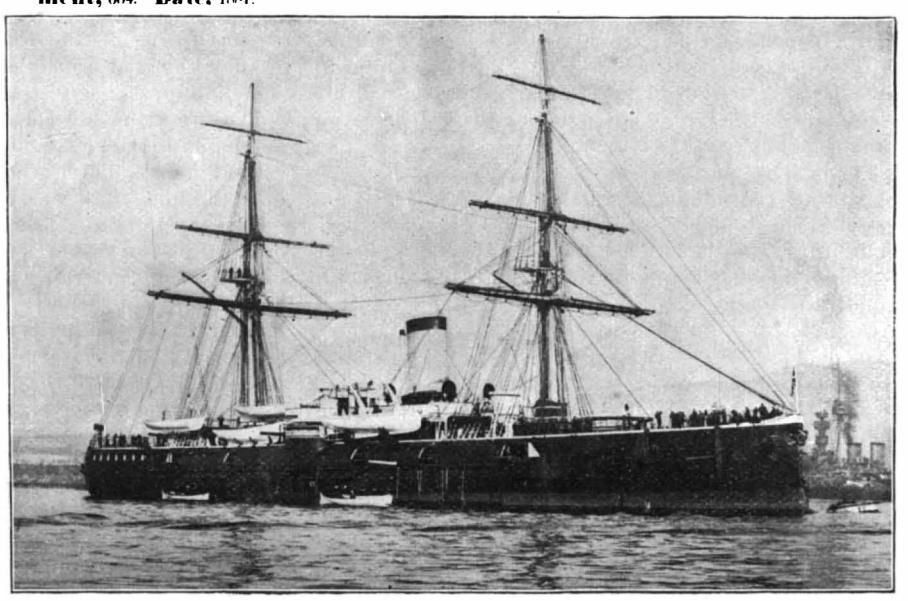
6.—First-class Battleship "Alexander II."

Displacement, 9,927 tons. **Speed,** 16·5 knots. **Coal Supply,** 1,200 tons. **Armor:** Belt, 14 inches; gun positions, 10 inches; deck, 2½ inches. **Armament,** two 12-inch B. L. rifles, four 9-inch, eight 6-inch, four 6-pounders, six 3-pounders, six machine guns. **Torpedo Tubes,** 5. **Complement,** 604. **Date,** 1887.



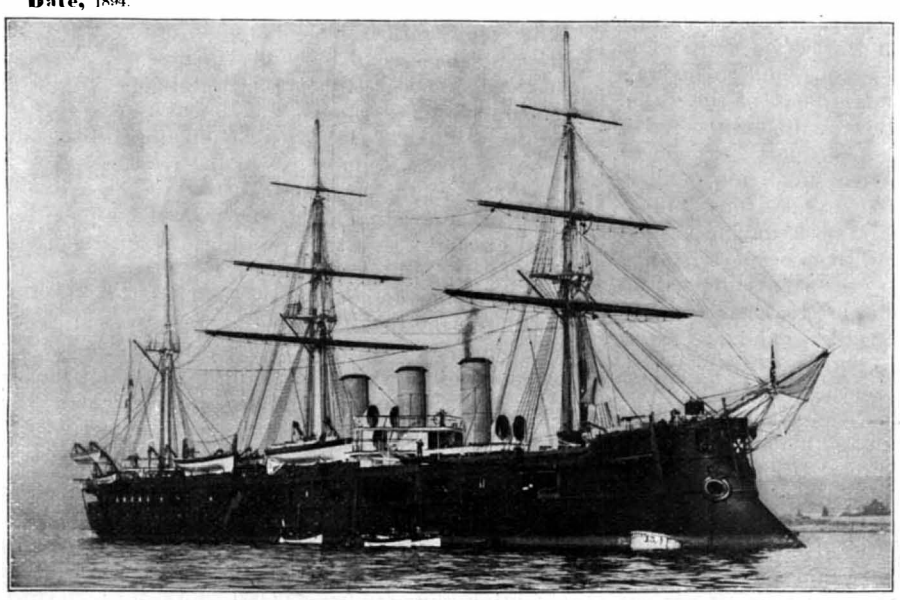
7.—Armored Cruiser "Rurik."

Displacement, 10,923 tons. **Speed,** 18 knots. **Maximum Coal Supply,** 2,000 tons. **Armor:** Belt, 10 inches; deck, 2½ inches. **Armament,** four 8-inch, sixteen 6-inch B. L. rifles, six 4·7-inch rapid-fire guns, eighteen small rapid-fire and machine guns. **Torpedo Tubes,** 5. **Complement,** 768. **Date,** 1894.



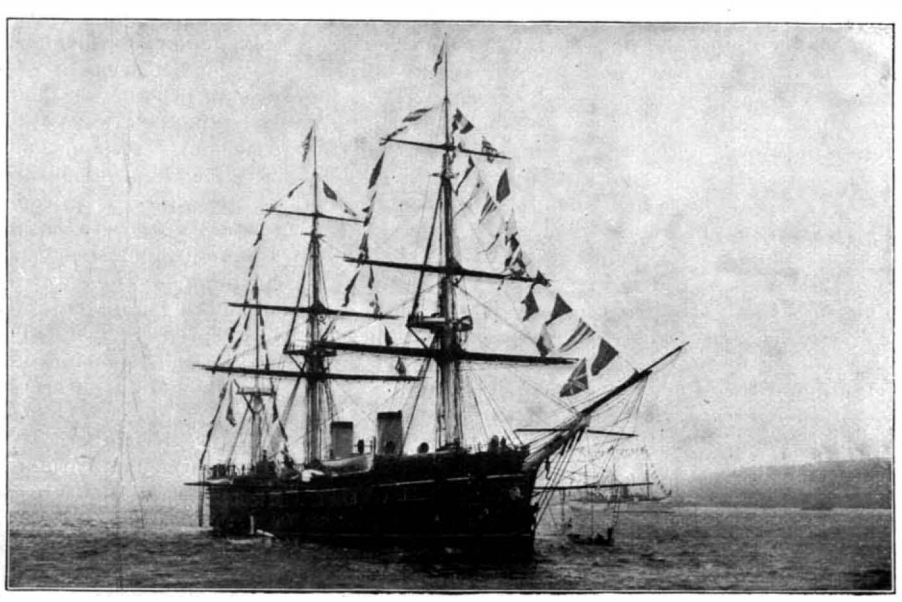
8.—Armored Cruiser "Admiral Nakhimoff."

Displacement, 8,524 tons. **Speed,** 16·7 knots. **Coal Supply,** 1,200 tons. **Armor:** Belt, 10 inches; gun positions, 8 inches; deck, 3 inches. **Armament,** eight 8-inch, ten 6-inch, fourteen small rapid-fire guns, six machine guns. **Torpedo Tubes,** 4. **Complement,** 567. **Date,** 1885.



9.—Armored Cruiser "Pamyat Azova."

Displacement, 6,675 tons. **Speed,** 18·8 knots. **Normal Coal Supply,** 1,000 tons. **Armor:** Belt, 9 inches; gun positions, 8 inches; deck, 2½ inches. **Armament,** two 8-inch, thirteen 6-inch B. L. rifles, fourteen small rapid-fire guns, three machine guns. **Torpedo Tubes,** 7. **Complement,** 525. **Date,** 1888.



10.—Armored Cruiser "Dmitri Donskoi."

Displacement, 5,882 tons. **Speed,** 16·5 knots. **Normal Coal Supply,** 400 tons. **Armor:** Belt, 6 inches; deck, 2½ inches. **Armament,** two 8-inch B. L. rifles, four 6-inch rapid-fire, ten 4·7-inch rapid-fire, sixteen smaller rapid-fire guns, four landing guns. **Torpedo Tubes,** 4. **Complement,** 510. **Date,** 1883.

NAVIES OF THE WORLD—IV. RUSSIA.

pound armor on belt and barbettes and is armed with four 12-inch, four 6-inch rifles, and eighteen small rapid-firers.

The other two battleships of the total seventeen that are ten years old or less are the "Navarin" (1891), of 10,206 tons and 16 knots, with 16 and 12-inch armor and carrying four 12-inch, eight 6-inch rifles and eighteen smaller guns, and "George the Victorious" (1892), of 10,280 tons and 16·5 knots, with 16-inch belt, 12-inch barbettes, and armed with six 12 inch and seven 6-inch rifles, eight 3·9-inch rapid-fire guns and several smaller rapid-firers.

The latter ship is an improvement on the three well-known battleships of the "Sinope" class (1886), the "Sinope," "Catherine II.," and "Tchesme." The distinguishing characteristics of these vessels is the large number of guns in the main battery (six 12-inch) and the peculiar triangular redoubt within which they are carried. The belt armor, 16 inches in thickness amidships, is continuous from stem to stern. At the level of its upper edge is a protective deck, 3 inches in thickness, and upon this is built up a huge redoubt with walls protected by 14 inches of armor, which rises through two decks to a vertical height of 18 feet, the upper edge of the redoubt being 3 feet above the main deck. In each angle of this central fort is placed a pair of 12-inch guns mounted on disappearing gun-carriages. The guns are loaded and trained below the shelter of the redoubt, rising to fire over the main deck as a glacis. These are the only battleships in the world which carry more than four guns in the main battery. But although the main battery looks formidable on paper, it is not more so than the four-gun battery placed in the usual two turrets, fore and aft. The concentration of fire on the broadside or aft is no greater, and while it is true four guns can be fired ahead, the system adopted in the late "Maine" allowed a concentration of four guns both ahead or astern. The fact that the Russians have not repeated the type is proof that it has not the merits of the standard two turret system. The chief objection is that one big shell entering the redoubt might disable the elevating mechanism of all six gun-carriages.

The three ships just mentioned come in the class of ships "10 to 20 years old." The other two battleships in this class are the "Alexander II." and the "Nicolai," the particulars of which are given beneath the cuts of these vessels. They are later vessels than the "Sinope" class, and great changes have been made as compared with their predecessors. Four of the 12-inch guns are thrown out and the remaining pair are placed in a single turret forward. The four 12-inch are replaced by four 9-inch rifles which are carried at the four corners of the broadside battery on the gun deck, and are capable of being fired dead ahead and dead astern. The secondary battery of eight 6-inch guns is carried in broadside between the 9-inch guns.

The modern character of the Russian navy is shown by the fact that among 23 battleships there is only one vessel in the "old battleship" class, the "Peter Veliky," of 9,891 tons and 14·5 knots, launched in 1872. She has 14 and 8-inch armor and carries four 12-inch 40-ton guns as her main battery.

COAST DEFENSE VESSELS.—The newest of the 14 coast defense vessels are the four ships of the "Admiral Oushakoff" class (1893-94), which are of 4,126 tons and 16 knots speed, are protected by a 10-inch belt, and a 3-inch deck, and have their four 9-inch guns protected by 7 to 8 inches of armor. Each is provided with four torpedo tubes. They carry 400 tons of coal and the complement is 318 officers and men. The names of the other ships are the "Admiral Seniavin" and "Admiral Apreaine," while a new vessel of the class is being built. These excellent little fighting ships constitute the best part of the coast defense flotilla. Next to them in value are the four modern armored gunboats of the "Gremiastchy" type (1890-95). of 1,500 tons and 15 knots speed, armed with one 9-inch, one 6-inch, and eight smaller guns, and protected by a 5-inch belt and a 1½-inch deck. Each gunboat carries two torpedo tubes. The above eight vessels are the best of the coast defense fleet, the other half dozen ships being old vessels of from 25 to 30 years of age. The most notable of these is the circular floating fort "Admiral Popoff" (1875), of 3,590 tons, which mounts two 12-inch guns and has a speed of 8 knots.

ARMORED CRUISERS.—The Russian navy includes 11 of these very useful and all around fighting ships. The best known of these are the "Rurik" (1894) and the "Rossia" (1896). The former, on account of her unprecedented size and fighting powers, created a great sensation at the time of her completion, and was no doubt the direct cause of the British Admiralty building the "Powerful" and "Terrible." She is of 10,923 tons displacement, is protected by a 10-inch belt, but has the moderate speed of only 18 knots. Her armament is, or was, the most sensational feature of the ship (we are familiar with mighty batteries now), comprising four 8-inch rifles carried in sponsons forward and aft on the main deck on the beam, with a fore and aft axial fire; sixteen 6-inch slow-fire guns, carried in broadside on the gun deck; six 4·7-inch rapid-firers carried between the 8-inch guns on the main deck, and 18 small rapid-firers. Another valuable feature of these ships is the large coal capacity of 2,000 tons. The weak feature of the "Rurik" is that her large armament is but poorly protected, none of the guns being provided with casemates and the shields being comparatively light and ineffective against the more powerful rapid-fire guns. The guns, moreover, are nearly all of the slow-fire pattern. The "Rurik" was followed by the "Rossia," an improved "Rurik." She is 1,200 tons larger, the same protection, practically the same battery, except that the six 4·7-inch guns are replaced by a numerous battery of 3-inch guns and all the weapons except the 8-inch are rapid-firers. The speed is raised to 20 knots and the coal capacity to 2,500 tons. Another change is the entire removal of the sails and yards, which are a conspicuous feature in the "Rurik." Critics complain that the same defect of limited protection for the guns exists in the "Rossia." The "Gromoboi" and another ship, both of the "Rossia" type, are now under construction.

Another well known armored cruiser is the "Pamyat Azova," of 6,675 tons, 18·8 knots, whose particulars will be found under the illustration of the ship. She is provided with full sail-power, the Russians showing a greater reluctance than any other nation to part with this relic of the days of wooden frigates and battle ships. The "Pamyat" has one peculiarity which will be noticed in the "Rossia," namely, a 6-inch gun firing through a port directly in the bow. This is also seen in several of the French ships. The "Admiral Nakhimoff" (1885) is another fine ship of this class. She is brig-rigged, and with her single elliptical funnel presents a very handsome appearance. In her main armament she closely resembles the "Brooklyn," having the same number of 8-inch guns similarly disposed, two forward, two aft, and two on each beam. These guns, however, are not so well protected, firing as they do from a barbette, whereas the "Brooklyn's" guns are in turrets.

The other six armored cruisers are of an average displacement of 5,754 tons and an average speed of 15·6 knots. The most modern of them is the "Dmitri Donskoi" (1883), a sheathed vessel, bark-rigged, of 5,882 tons and 16·5 knots speed, which will be familiar to many of our readers as having figured in the Columbian Naval Review at New York. Our cut is made from a photograph taken as the vessel lay in the North River. The "Vladimir Monarch" (1882), of 6,061 tons and 15·2 knots, carries five 8-inch and twelve 6-inch guns; the "General Admiral" is armed with six 8-inch and two 6-inch, while the remaining two carry four 8-inch as the main armament.

PROTECTED CRUISERS.—It is only during the last two or three years that Russia has paid much attention to the protected cruiser class, in which she has only some half-dozen of over 2,000 tons built or building. One of these, the "Korniloff," 5,000 tons, 17·5 knots, two 8-inch and fourteen 6-inch guns, was built in 1887 and refitted in 1895. Three others, the "Bogatyr," "Askold" and "Novik," 6,630 tons, 20 knots, carrying six 5·9-inch and six 4·7-inch rapid-firers, are being built in German yards, while two vessels of 6,500 tons and 23 knots speed are being built in France and the United States, one at Toulon and the other at the Cramps' yard in Philadelphia. The Cramp vessel, which will be named the "Waryag," like the others of her class, in addition to her high speed will have a powerful armament, consisting of twelve 6-inch, twelve 3-inch, and six 1⅞-inch rapid-fire guns, besides four torpedo tubes. A full description, with illustrations, of this ship was given in the SCIENTIFIC AMERICAN of November 5, 1898. Other cruisers that can steam above the 15 knots per hour adopted as a limit in these comparative articles are the "Merkuriya," 3,050 tons, 16 knots, carrying six 6-inch guns, and the "Svietlana," 3,828 tons, launched in 1896 at Havre, a vessel of 20·2 knots, armed with six 5·9-inch rapid-fire Canet guns, and ten 1·8-inch, and carrying a maximum coal supply of 1,000 tons.

SMALL CRUISERS AND GUNBOATS.—This class in the Russian navy is made up of thirty-two ships of an average displacement of 1,250 tons and an average speed of 16·6 knots. The four gunboats of the "Donetz" type (1887) have the following dimensions: Displacement, 1,224 tons; speed, 13·5 knots; armament, two 8 inch, one 6-inch, and seven small guns. There are nine gunboats of from 1,200 to 1,300 tons, built of iron and wood between 1878 and 1882, having a speed of 13 knots, and armed either with two 8-inch or three 6-inch guns. The most recent vessels in this class are half a dozen gunboats of from 400 to 500 tons, which show speeds of from 20 to 23 knots, and are armed with 1·8 and 1·4-inch rapid-fire guns.

In concluding our review of the Russian navy, we wish to emphasize the fact that it is essentially a fighting navy, the bulk of its tonnage being made up of heavily armed and armored ships. High speed is not a characteristic feature, and the Russians appear to have been satisfied to sacrifice this quality in favor of armor and guns. As Great Britain has elected to set up the combined strength of France and Russia as the standard which she must at least equal, if not surpass, it is interesting to compare the relative strength of the "Dual Alliance" and the "Mistress of the Seas," as shown by our system of comparison by displacement.

COMPARATIVE FIGHTING STRENGTH.

DESCRIPTION OF TYPE.	GREAT BRITAIN.		FRANCE AND RUSSIA.	
	Number of Ships.	Total Displacement, in Tons.	Number of Ships.	Total Displacement, in Tons.
Battleships, 10 years or less,	34	476,272	31	350,798
Battleships, 10 to 20 years.	11	104,214	14	141.859
Battleships, Old or Refitted.	9	79,848	13	99.675
Totals	54	660,334	58	592,362
Coast Defense Vessels.	25	157,100	28	91,730
Armored Cruisers, 9,000 tons and up.	8	108,000	11	115,753
Armored Cruisers, 7,000 to 9,000 tons.	2	16,800	4	31,624
Armored Cruisers, Below 7,000 tons.	7	39,200	16	90,304
Totals	17	164,000	31	237,681
Protected Cruisers 10,000 tons and up.	10	116,400	....	.....
Protected Cruisers 7,000 to 10,000 tons	11	85,550	4	32,056
Protected Cruisers 4,000 to 7,000 tons	30	150,000	17	87,717
Cruisers, 2,000 to 4,000 tons.	46	134,510	22	66,438
Totals	97	486.460	43	186,211
Small Cruisers and Gunboats.	97	89,628	70	77,554
Grand totals	290	1,557,522	230	1,185,538

Great Britain, evidently, is holding her own with a safe margin to spare, having about twenty-five per cent more ships and thirty per cent more total displacement than France and Russia combined. To this must be added the incalculable advantage that comes from having ships built upon identical lines, with the same maneuvering qualities as to speed and helm (turning movements), and the same arrangement of batteries. If to this be added the gain resulting from the fact that the personnel is of one race and language, the actual superiority must be increased from thirty per cent to fully forty or fifty per cent.

Comparing the French and Russian navies, we are inclined to think that the greater homogeneity of the Russian ships, their heavier armaments, the fact that they are, as an average, of later construction, and the more stubborn fighting qualities of the Russian sailor considerably offset the numerical superiority of the French navy. The total numbers and displacements are for the French navy 144 ships and 731,629 tons and for the Russian navy 86 ships and 453,899 tons.

Character of the Tagales.

A writer in the Neuesten Nachrichten, Munich, describes the Tagales, the dominant race in the Philippines, in the main as follows:

They are not incapable of adopting civilization in the modern sense, as they are a very mixed race. The admixture of Chinese blood has produced very good results. The number of mestizos whose father was white is also very large, and it is these descendants of the Spaniards who fight the battle of freedom. Nor are the Tagales themselves without civilization. They have shown much natural strength, have advanced from their original home in central Luzon to every part of the Philippines and assimilated many Malay tribes. Two enemies they have, which are more dangerous than either the Spaniard or the Americans. They are indolent and their morals are lax. The Spaniards have done much to civilize them, but to this day many return to the life of a hunter after some years' residence in towns and villages. They were, nevertheless, in a pretty advanced state of civilization when the Spaniards came. This is easy to see in the Igorrotos, a kindred race, which remains heathen to this day. The Igorrotos live in fine villages of well-built houses, and their agricultural system is really worthy of admiration. The Tagales themselves are ardent Catholics, but they retain many heathen customs. Their highest aim is to get a son into the church, but they do not observe celibacy very strictly. Many of the mestizos, Chinese as well as white, are wealthy men, and as these lead in the movement for independence, it will be difficult to conquer the islands.—Translation made for The Literary Digest.

Collapse of a Grand Stand.

The steel grand stand at Monmouth Park race course was recently destroyed by a storm. It was the largest struture of its kind in the world. The total length of the building was 700 feet and its width was 210 feet; the seating capacity was 12.000; 1,000 tons of steel, 1,000.000 feet of lumber, and 500,000 bricks were used in its construction. The cost, including dining rooms, furnishings, etc., was $180,000.

A New Form of Photographic Telescope.

Prof. E. C. Pickering, of Harvard, has made a strong plea in favor of certain new methods of conducting astronomic work. A great number of very large telescopes of nearly the same form, he says, have been given to observatories during the last few years. Although such instruments are indispensable, in a limited number of investigations, yet when the latter are divided among so many telescopes the results obtained by each are often disappointing to the donors. These instruments have been erected, with two or three exceptions, in places selected from local or political motives, and without regard to meteorological or astronomical conditions. For this reason, the great observatories of the world are near large cities or universities where the very conditions that have rendered the countries great have rendered them unfit for the most delicate astronomical research. Nine-tenths of these instruments are in the temperate zone in Europe and the United States, while the southern hemisphere has been entirely neglected and many of the most interesting parts of the southern sky have not yet been examined by a modern telescope of the largest size.

This duplication of expensive instruments in unsuitable localities is rendered still more objectionable by another condition. All the telescopes are similar in form, their focal length being from fifteen to eighteen times the aperture, and, therefore, all are best adapted to the same kind of work. In view of these numerous precedents, it was a bold step to deviate from it. But this step was taken, and taken by a woman, Miss Catherine W. Bruce, of New York, who gave $50,000 to the Harvard College Observatory to construct a telescope of 24 inches aperture, in which the focal length should be only six times the aperture. Fortunately, this experiment succeeded, and the Bruce photographic telescope is mounted in Arequipa, Peru, in a climate unsurpassed, so far as is now known, for astronomical work. Its immediate results are charts, each covering a large part of the sky and showing such faint stars that 400,000 appear upon a single plate. By its aid, many new stars of the peculiar fifth type have been found in the Large Magellanic Cloud, showing an additional connection of this object with the Milky Way. A group of forty nebulæ, hitherto unknown, has been found in another part of the sky. The most important work of the Bruce telescope, however, is that every year it sends hundreds of photographs to the great storehouse at Cambridge. Besides the immediate discoveries made from these plates, they doubtless carry with them many secrets as yet unrevealed, and many images of objects of the greatest interest yet to be discovered. A striking example of this kind is found in the recent discovery of the planet Eros, which, next to the moon, is sometimes our nearest neighbor in the heavens. Calculation showed that this planet must have been near the earth, and therefore bright, in 1894. An examination showed that this object, although not discovered until 1898, had not escaped the Harvard telescopes. Two images of it were found upon the Bruce plates, fifteen upon the Draper plates and three upon the Bache plates. It can thus be followed through nearly half a revolution. Six images were also obtained in 1896, when it was more distant and much fainter.

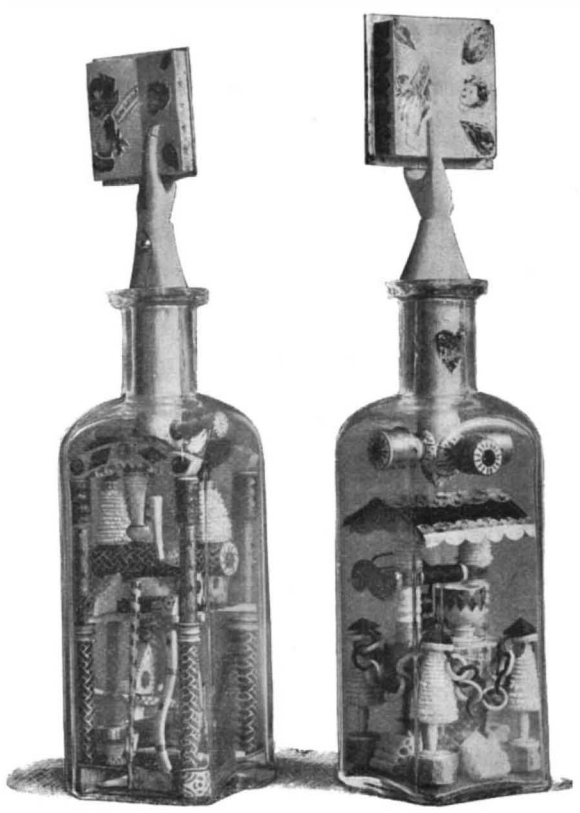
These examples show the advantages of trying new forms of telescopes instead of duplicating those now existing. The Bruce telescope is well adapted to investigations in which the focal length is small. It will therefore be interesting to try the effect of a great focal length. It is proposed to build a telescope with an aperture of 12 to 14 inches and a focal length of 135 or 162 feet. This telescope would probably be placed horizontally and the star reflected into it by means of a mirror. The motion of the earth would be counteracted by moving the photographic plate by clockwork. It would thus become a large horizontal photoheliograph. This method of mounting a telescope for use on the stars was advocated by the writer in 1881, and has been used here since then with successive telescopes of 2, 4, and 12 inches aperture. The instrument here proposed would be adapted to investigations for which a great focal length would be needed, as the latter would be more than a hundred times the aperture. Several such investigations may be suggested, any one of which, if successful, would amply justify the construction of such an instrument.

Prof. Pickering says the best instrument now in use for photographing the sun is the horizontal photoheliograph. It is a small instrument of this form. Under favorable atmospheric conditions finer details on the sun's surface could be obtained with a large instrument than have yet been photographed. It could also be used in photographing the protuberances, and it should not be forgotten that preparations must be soon made to observe the solar eclipse of May 28, 1900. The new instrument might be useful in photographing the spectrum of the reversing layer and in showing the details of the inner corona. Images of the moon obtained with such a telescope would be more than a foot in diameter, even if printed without enlargement. These would probably surpass the best photographs yet taken. It is possible that good results could be obtained with Jupiter, Saturn, and perhaps Mars. The planet Eros approaches the earth in 1900. This will be a more favorable time for observation than any other until 1927. Careful preparations should, therefore, be made for observing Eros when east and west of the meridian, since the distance of the sun can probably be determined with more accuracy in this way than by any other method of observation yet attempted. This is one of the greatest problems of astronomy, although it was supposed to be solved in the eighteenth century, but it will probably be left until the twentieth century for a satisfactory solution. It is expected that the positions of the adjacent stars could also be determined with this instrument, with an accuracy approaching that of the heliometer.

A CONVICT'S INGENUITY.

Not infrequently it happens that the inmates of prisons display a degree of ingenuity not always possessed by their more fortunate fellowmen. How dextrous prisoners are, even in the making of trifles, is well exemplified in two little bottles which have been sent to us by an inmate of the State's Prison at Windsor, Vt., who has built up a small trade in selling his products. The small price at which these bottles are sold is hardly proportionate to the time and labor spent in making them.

METHOD OF LOCKING THE STOPPER-ARMS.



CURIOUS BOTTLES MADE BY A CONVICT.

In these bottles there have been inserted a number of objects of a size and structure which would apparently preclude their entrance through the bottle-neck.

To carve over seventy-five pieces of wood, to put those pieces into a four-ounce medicine bottle, and to combine and fasten them together so that they shall assume the forms of utensils employed in everyday life, is assuredly a task which requires no little skill.

Within one of the two bottles in question a little carpenter's shop has been fitted up. Here may be seen a small shaving-bench with its draw-knife, a gayly colored chopping-block with a hatchet half-embedded in the wood, and an ax ornamented with glittering tinsel, propped against the bottle-wall. Upon a sawbuck in the upper half of the bottle a motley-colored log, nearly severed by a cross-cut saw, is mounted. At its inner end the bottle-stopper is provided with two projecting arms held in sockets by means of elastic strips of rubber.

Within the second bottle a miniature well, with its windlass and bucket, is arranged; and upon the edge of the well there stands a wooden goblet. In each corner of the bottle a delicately whittled tree has been placed. From tree to tree runs a little chain formed of colored pieces of wood, the cutting of which was no doubt the work of days. The stopper of the bottle is provided with four projecting arms. The manner in which these arms are locked in place is shown in one of our illustrations, and certainly constitutes one of the most remarkable features of the work. To the inner ends of the arms strings have been attached and passed up through a central passage running longitudinally through the stopper. By pulling the strings the arms would naturally be forced against the stopper; after having been thus pulled into place, the arms were permanently held by gluing or cementing the strings to the stopper.

One naturally asks, How were all these numerous pieces inserted? The pieces of wood are all smaller than the neck of the bottle, and only the ingenious manner in which they have been combined and fastened together gives to each object its peculiarly large size. The separate pieces were first dipped in glue and then put in place by means of a long and slender pair of wire pliers.

These curious bottles are remarkable for the great patience required in fashioning each piece and for the delicacy of touch and deftness necessary in placing the parts in their proper positions.

March Number of Our Building Edition.

The March number of the Building Edition of the SCIENTIFIC AMERICAN is the handsomest number of this journal which has ever appeared, and it is certainly one of the most artistic numbers of any periodical which we have ever seen. The cover consists of a beautiful colored plate representing a residence at San Rafael, Cal. The house is an adaptation of the Moorish "mission" style that is coming into great favor, not only in the Southwest, but also in the North. The style is an evolution of the "adobe" and is one of the most picturesque houses imaginable, being located upon a side hill, the mountain in the rear forming an appropriate background. On opening at the first page we find the courtyard of the Mattei Palace, Rome, illustrated by an exquisite half-tone. There are also thirteen pages of engravings of modern residences, including colonial and gambrel-roofed houses, a casino, and a modern stable. The literary matter in the number is of more than usual interest. It includes a critical review of the exhibition of the Architectural League, and it also contains considerable matter valuable to not only builders, but to those interested in the building of a home. Those of our readers who are not acquainted with the Building Edition should purchase a copy of this unique number, which gives them an admirable idea of the scope of this publication.

The Current Supplement.

The current SUPPLEMENT, No. 1210, contains a number of articles of prime importance. "How to Make a Sewing Machine Motor Without Castings" is an article by Cecil P. Poole. This article is accompanied by no less than twenty-five working drawings, which will enable any mechanic of average ability to complete a highly efficient motor for operating sewing machines or light machinery. This is another article in the electrical series which we are publishing. "Nernst's Electric Light," by James Swinburne, is a very important paper read before the Society of Arts. The Nernst light appears to have an enormous future in store for it. "Trade Suggestions from the United States Consuls" occupies another page and is a new department of the SUPPLEMENT which will be continued regularly. "Transcaspian Railway" is an illustrated article. "An Abstract of the Report of the Commissioner of Patents for the Year 1898" gives a valuable summary of the work and needs of the office and desired legislation. Dr. Howard's "Economic Status of Insects as a Class" is completed. "Nutrition Investigations at the University of Tennessee" is an elaborate paper.

Contents.

(Illustrated articles are marked with an asterisk.)

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

COFFEE-PULPING MACHINE.—RICHARD T. RICKARD, Honokaa, Hamakua, Hawaii. This machine consists principally of a diagonally-grooved pulping-roller mounted to rotate over a segmental bed-plate having ribs. In the machine there is also included a pair of rollers for separating the berry from the pulp, one of the rollers being plain and the other grooved to feed the berry bodily forward, at the same time allowing the pulp to pass down betwen the rollers.

SEED-DRILL. — ROBERT H. SLEISTER, Nebraska City, Neb. The device provided in the present invention is designed to be attached to drills or other agricultural implements as a substitute for the usual seed-planting mechanisms. The device is supported from a draw-bar. To this bar a furrowing device is secured, having a rotatable disk. A seed-conveying spout extends downwardly alongside of the disk, and is pivoted at one side of the disk-journal. A cap is carried by the spout, and covers the hub of the disk to form a guard or sand-band therefor. In use the seed will be deposited through the spout, and will fall in the furrow made by the furrowing device. The seed will then be covered by the soil as it falls back in place.

CULTIVATOR.—JOHN U. G. MORRISON and ANDREW A. KREGNES, Hooker, S. D. The cultivator is designed particularly for cultivating corn-land, and is broadly characterized by one or more revolving blade-cylinders, the cutting edges of which move in the plane of the surface of the ground and pass lightly below the surface. so as to sever the roots of the weeds.

FRUIT-GRADER.—WALTER MORLEY and ALBERT M. PATRICK, Salem, Ore. It is the purpose of this invention to provide a machine which shall grade or select fruit according to its size, and which shall furnish within a comparatively short space a considerable length of screening devices having both a vertical and longitudinal reciprocating movement. The screen-trays are carried in a frame and supported one above the other. Links connect the ends of an upper and lower tray, and serve to move the two trays in opposite directions. The fruit runs from one screen to another, in order that the various sizes may be separated by the different meshes of the screens. During this operation the screen-trays will be reciprocated in order more effectually to separate the fruit.

AUTOMATIC SWINGING STACKER.— CARROLL D. CLIFFELL, Redwood Falls, Minn. This invention provides an improvement in straw-stackers attached to threshing machines of that class which are swung upon their pivots so as to deposit the straw in a circle. The stacker comprises a straw-elevator pivoted at its lower end to swing horizontally; a curved bar carried by the stacker and having teeth upon its upper and lower edges and about its ends; a shaft having a pinion engaging the teeth of the curved bar, and a pivotal driving connection; and fixed vertical guides engaging the swinging end of the shaft and limiting its movement to a vertical plane.

Electrical Apparatus.

TELEPHONE-CALL REGISTER.—BRUNO KRAUSSE, Wilmersdorf, Germany, The present invention provides a device for registering either the length of time a telephone-subscriber uses his instrument in actual conversation with other subscribers, or the number of conversations, so that the time consumed in talking with the central office will not be registered. By means of a circuit-closing device operated from the station called up when the receiver is taken from its hook, both stations are connected in such a manner, for a short time, that the current then passing is strong enough to operate at the call-end a clock or registering apparatus, or both together.

ELECTRIC SWITCH. — ANDREW H. MILLER, 35 Bank Block, Denver, Col. The present invention pertains more particularly to switches for electric lamp circuits, and provides a switch by means of which the lamps in two circuits may be readily placed in series of multiple distribution. The switch may be so manipulated as to throw the whole voltage into one circuit to produce the full power of light in the lamps of the circuit, or to divide the current and distribute the voltage in the two circuits, thus causing the lamps to burn low. When the lamps are turned down, the inventor claims that a saving of seventy-five per cent in current is effected. The apparatus is characterized by the simplicity and inexpensiveness of its construction, as well as by the effectiveness of its operation.

ELECTRICAL TRANSMISSION OF SOUND. — FRANK M. BELL, assignor to J. DOZIER POU, Columbus, Ga. Connected with a telephone-transmitter is a beam operated by the sound-receiver and provided with adjustable weights and a movable contact. A parabolic reflector, containing a lamp in circuit with the contact and beam, is provided and confronted with a selenium plate in connection with a battery. When the receiver is set in motion by sound-waves, an up-and-down movement is imparted to the balance-beam, which movement becomes that of the resistance. Variation of the resistance produces variation in the lamp-light. These variations in light produce corresponding variations in the conductivity of the selenium plate, which variations are transmitted to the line or cable-conductor.

Engineering Improvements.

ROTARY ENGINE.—ROBERT O. DOBBIN, Waterloo, Canada. This engine comprises an annular cylinder-chamber having a rotating disk forming one side thereof. The cylinder has fixed abutments projecting inwardly from opposite walls, but reaching only part way to the center. The rotating disk has a flange formed in segments of a width to fit between the abutments, and carries rotary piston-heads formed as short segments, similar in thickness to the flange, and rotatable upon their axes in such a manner that they extend at all times in the same direction.

PUMP.—ADOLPH RICHTER, Manhattan, New York city. A slide is rigidly connected with the pump-piston; and upon the slide a transverse shaft carrying a pinion is journaled. A stationary rack engages the pinion to rotate the shaft. Upon the shaft, valve-operating projections are located. As the pump-piston reciprocates, it imparts a like motion to the slide, and the pinion rolling upon the stationary rack bar will, in addition to the reciprocating movement, receive a rotary movement. The parts are so arranged that, as the piston nears the end of its stroke, an arm will come into contact with one of the projections above referred to, and will shift the valves by throwing the arm and connected parts.

Mechanical Devices.

MUSIC-LEAF TURNER.—ALFRED G. LAMB, Cresco, Iowa. The music-leaf turner is provided with mechanism whereby, through the medium of compressed air, spring-controlled leaf-turning arms may be operated by a performer to turn the pages successively, it being possible to control the compressed air either by pressure of the foot or by pressure of the hand. The device is thoroughly automatic in its action, and its mechanism acts immediately upon the application of the air power.

BICYCLE-PATH OR SIDEWALK LEVELER AND ROLLER. — SAMUEL P. HEDGES, Greenport, N. Y. This machine is designed to be controlled by a single man, and is so constructed that, when the scrapers are to be brought in contact with the ground, the movement of the controlling-lever will be toward the operator, thus enabling him to work the scraper-blades to great advantage at the least expenditure of power. At the front portion of the machine, shoes are pivoted which tend to support this portion of the machine. These shoes are shaped so as to carry the machine over small or moderately large depressions in the path or sidewalk, enabling the scraper-blades to act evenly upon the ground.

Miscellaneous Inventions.

WRITING-TABLET HOLDER.—RUTHERFORD H. PAXTON, Florence, Colo. This paper-pad holder is designed to be hung vertically on a door or wall, so that visitors may leave messages upon the pad. To a body-plate, a spring-tongue is secured which is capable of engaging the stiff back of the paper pad. A clamping-frame is mounted to swing toward and from the body-plate.

CORSET.—JULIA C. MACKEY, New Castle, Pa. The corset, on its body portion adjacent to the busks, is provided with holding devices, each consisting of a strip of fabric secured along its outer edge to the body portion, and also transversely at intervals to form flaps adapted to be taken hold of by the wearer to draw the busks together. The corset may hence be closed without danger of injuring the fingers on the sharp edges of the steels.

DREDGING-BUCKET. — HARALD J. KROMANN, Manhattan, New York city. This dredging-bucket is especially adapted for dredging sand. The bottom of the bucket may be readily opened or closed. The invention provides means whereby the bucket may be dropped perpendicularly, carried over any desired spot where dredging is to be done, and readily inclined so that its spout will enter the surface from which material is to be removed.

BARREL.—ROBERT T. HARGROVES, Churchland, Va. This inventor has devised a ventilated barrel for use in conveying garden truck. In carrying out the invention the staves are made wedge-shape and uniform in size, and are formed from the blank of veneer without any loss of material. Each stave reinforces the other, and affords ample ventilation. The barrel is strongest at its ends, the staves being so formed as to facilitate the formation of the bilge without producing a weakening effect.

POLISHING-DEVICE.—JAMES WHITTENHAM, Manhattan, New York city. The polishing devices comprise a base and a beveled rocking member pivoted to side flanges on the base. The rocking-member and base are provided with surfaces of emery. In operation, one hand of the operator is to be placed palm down upon the upper surface of the rocking-member. By pressing with the fingers rearwardly of the pivotal point, the member will be rocked. A knife-blade is then inserted and the rocking-member moved thereon, after which the blade is moved back and forth to polish the sides and also the back.

SHEARS FOR RIPPING SEAMS.—LEMUEL MERRILL, Melrose, Mass. One of the shear-members has its end pointed and its edges sharpened to form a knife. The end of the other member is formed as a plate bent about the end of the cutting member to form a shield therefor. This second member is also provided with a slot and a saw-tooth notch, serving to prevent the clogging of the shears by the cut threads. In ripping a seam, the two members are operated to cause the edge of the cutting member to reciprocate across the notch and slot in order to cut the stitches. The shield prevents the blade's engaging the cloth.

BOLT OR PIPE-EXTRACTOR.—ALBERT ST. ALVIN UTT, Chicago, Ill. The extractor comprises a lever having two jaws at one end, a bolt projecting inwardly from each jaw, and wedge blocks pivoted on the inner sides of the jaws and mounted to slide on the bolt. The jaws are placed over the bolt or pipe to be drawn, with the wedge-blocks engaging the sides of the bolt or pipe. By depressing the outer end of the lever, the jaw-end will be raised. This will serve first to clamp the blocks tightly upon the bolt and then to raise the bolt. As the outer end of the lever is raised for a new purchase, the blocks will be freed from the bolt and will drop down for a new bite.

PACKING-BOX.—CHARLES A. ROBBINS, Manhattan, New York city. This invention provides an improvement in packing-boxes in which each of the parts consists of a frame and a lining therefor, the frame being ordinarily of wood and the lining of pulp. On account of its lightness and strength, the inventor uses jute-pulp. Heretofore boxes of this character have not been strong enough to meet all requirements. The inventor overcomes the difficulty by using open frames provided with double lining. A portion of the lining has its edges bent around members of the frames so as to be clamped between two frames. A box thus constructed possesses the three desirable features of lightness, strength, and impermeability to water.

GAS-FURNACE. — CHARLES W. RICE, Columbus, Ohio. The combustion-chamber of this furnace tapers toward its upper end, and is surrounded by the main body which communicates therewith at the top only. A drum is located on top of the main body in contact therewith so as to receive heat by transmission. Pipes connect the drum with the lower part of the main body. A smoke-pipe is connected with the drum. By the use of a deflector-plate the top or crown sheet of the furnace is protected.

LEMON-SQUEEZER. — JOHN W. NEAL, Kealia, Hawaii. This lemen-squeezer belongs to that class in which two sections are hinged together and provided with a bowl and knife, so that the lemon is forced into the bowl by the movement of the sections toward each other, the knife serving to cut the lemon simultaneously with the squeezing. The novelty of the present invention resides in the use of a spring-ejector to dislodge the lemon-rind.

SECTION-LINER.—EDWARD E. SHELDON and JOSEPH T. FREEMAN, Rochester, N. Y. This drawing-tool is designed to be attached to a T-square or rule, and is provided with a rod, spring-pressed in one direction. The rod can be reciprocated by means of a hand-operated device. A clutch coacts with the rod and serves to engage and disengage the rod, whereby the clutch may be advanced step by step by the movement of the rod, hence imparting a similar movement to the ruling edge connected with the clutch. By means of this device, section-lining, laying off distances and ordinates, spacing, obtaining angles, and the like, can be readily accomplished.

WAGON-STARTER. — BENJAMIN J. SYKES, Troutville, Pa. The starter is intended for use in holding a wagon on a hillside, and for storing up energy to aid in starting the wagon, so that the horses can be stopped while ascending a hill and the wagon be held by the device. The starter includes a pointed rod sliding in a casing and actuated by a spring. The rod is connected with the rear axle and is arranged so that its point will be embedded in the ground. As the weight of the wagon moves back on the rod, the spring will be compressed, thus storing energy, which will be used in assisting the starting of the vehicle. The device is simple in construction, easy of application, and, when not in use, can be readily removed and packed away.

Designs.

NECKTIE-FRAME.—WILLIAM J. SMITH, Brooklyn, New York city. The frame consists of a front portion having a hole formed therein, and two arms rising at the sides of the front. The arms embrace the collar, and the cravat is passed through the hole in the front portion before being tied. The device prevents the movement of the bow after having once been tried.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for 10 cents each. Please send the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

GEOLOGICAL SURVEY OF CANADA. Annual Report. New Series. Vol. IX. 1896.

The portly volume before us is full of valuable information relating to the geological and mineralogical resources of Canada. There is no question that Canada has a great future before her as regard valuable deposits of minerals, etc., and the survey should be complimented on the valuable report, which shows that not only the practical but the scientific side of the subject is not neglected.

OUTLINES OF INDUSTRIAL CHEMISTRY. A Text Book for Students. By Frank Paul Thorp, Ph.D. New York: The Macmillan Company. 1898. Pp. 541. 8vo. Illustrated. Price $3.50.

We have long waited for a modern book on this subject which would be strictly scientific, but which would also give in plain, intelligible language the modern processes for making the various chemicals, and information relating to the carrying on of various chemical industries. The need of a thoroughly modern book in English on the subject has been very pronounced, and we are happy to say that at last we have a book which, while possibly not ideal, fills nearly all the conditions of a book of this kind. The author has taken an extremely heterogeneous collection of material and has assorted and combined it with rare judgment. The result is immensely satisfactory. We shall place the book among our standard books of reference.

TRANSACTIONS OF THE WAGNER FREE INSTITUTE OF SCIENCE OF PHILADELPHIA. Vol. III. Part IV. April, 1898. Philadelphia. Pp. 571-946.

CURRENT OBSERVATIONS OF ESSENTIAL OILS. By W. J. Bush & Company, Limited, Distillers of Essential Oils. First Edition. London. 1898. Pp. 44.

DAS KLEINE BUCH VON DER MARINE. Ein Handbuch alles Wissenswerten über die deutsche Flotte nebst vergleichender Darstellung der Seestreitkräfte des Auslandes. Von Georg Neudeck und Dr. Heinrich Schröder. With one map and 646 illustrations. Kiel and Leipsic: Lipsius & Tischer. 1899. Pp. viii, 351. 12mo. Price cloth, 60 cents.

Germany's navy, although not the largest in the world is of no little importance, because it must protect a commerce which, in size, is exceeded only by that of England. The work which lies before us describes this navy most minutely, tells of its past achievements and future possibilities. The book is divided into four parts, in which are respectively discussed the history of the German navy, its organization and personnel, the various vessels, the naval stations and the Kaiser Wilhelm Canal. An appendix contains a comparison of the navies of the world. The clearness which characterizes the descriptive matter, and the thoroughness with which everything that bears even remotely upon the German navy has been discussed, certainly confirm the statement found on the title page, that the work is "a handbook of all that is worth knowing of the German navy."

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7605) E. W. B. asks: 1. How can I make a photographing camera to take 4×5 pictures, on plates or films? It must have time or instantaneous shutter, must be provided with finder, and be adapted to taking scenery, groups or single objects. Also what will be the probable expense of making? A. Several cameras are described with illustrations in Hopkins' "Experimental Science," price $4. As to expense, it will probably cost you more to make a camera than to buy one, though the materials, except the lens, cost very little. You should buy the best lens you can afford, a rapid rectilinear lens, if it is to do all the sorts of work you mention. 2. What is used to sensitize plates, and how used? A. Plates are coated with an emulsion of gelatine and nitrate of silver. The process is described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 541, 467, 647, 649, 1042, price 10 cents each. 3. Can you give directions for making the electric house lamp pictured in the issue of December 17? A. We must refer you to the manufacturers of the lamp, whose address is given in the number mentioned. 4. Why does mercury adhere so closely to tin, and not to any other metal? A. Mercury adheres to most common metals when they are clean. The only ones to which it does not adhere are iron and platinum. 5. Can you give complete instructions for making a ¼ horse power dynamo? A. A quarter horse power dynamo is described in a little book by Watson, price 50 cents.

(7606) C. F. N. asks: 1. If a solid rod of iron 10 feet long and ½ inch in diameter be suspended 7 feet from long end and 3 feet from short end, how much weight must you hang from short end to make it balance? A. A weight equal to ⅔ of the weight of the iron bar 10 feet long, placed at one end of the bar, will cause it to balance when suspended at a point three feet from the same end. 2. An ohm measures resistance, but I cannot understand why the more resistance you give a telegraph instrument, the better it works. A. The sounder does not work better because of its greater resistance, but because it has a larger number of turns in its coils. Its resistance is simply a convenient mode of specifying the amount of wire in it. When the current becomes very weak, as in long telegraph lines, a large number of turns on the sounder is necessary to produce magnetism enough to work the armature. For that reason relays and sounders on long lines have high resistance.

(7607) A. B. P. asks: 1. How can I make a preparation to keep moth from clothing, something that has no strong odor? A. Lupulin, 1 drachm; snuff, 2 ounces; camphor, 1 ounce; cedar sawdust, 4 ounces. Mix. This is to be used for sprinkling where the moths frequent. 2. Also please tell me how to make a cheap "flashlight" powder for making photographs. A. Magnesium, 40 per cent; permanganate of potassium, 40 per cent; peroxide of barium, 20 per cent. Or purchase 1 ounce of magnesium powder and 1 ounce of negative guncotton from dealers in photographic materials. Place on a dust pan enough cotton, when pulled out and flattened, to measure about 3½ inches in diameter. Sprinkle

it over with 20 grains of magnesium powder to form a thin, even film. Lay over the magnesium thus arranged a very thin layer of guncotton. Connect to the bunch of cotton a small fuse of twisted cotton about 6 inches long, so that it will extend to the side of the dust pan. Then set the pan on a step ladder near the object, and when ready, light the guncotton fuse with a match, when instantly a brilliant flash will ensue. There are several ready prepared magnesium compounds now sold with special devices and lamps to fire them. 3. Also, how to make a good, cheap, vanilla extract? A. Cut up fine 1 ounce vanilla bean, grind with 2 ounces of loaf sugar, in a mortar, mix 8 ounces of rose water and 24 ounces of alcohol 95 degrees, add a portion to the vanilla and sugar, put in a displacer and pour on the balance of diluted alcohol. Add a few drops of caramel if not dark enough.

(7608) J. H. F. E. asks: Can you give me the receipt for making the glue preparation that will, when spread upon a perch or any other object, hold fast birds or whatever may come in contact with it? A. Boil the middle bark of the holly, gathered in June or July, for six or eight hours in water, until it becomes tender; then drain off the water, and place it in a pit under ground, in layers with fern, and surround it with stones. Leave it to ferment for two or three weeks, until it forms a sort of mucilage, which must be pounded in a mortar into a mass, and well rubbed between the hands, in running water, until all the refuse is worked out; then place it in an earthen vessel, and leave it for four or five days to ferment and purify itself. Remarks: Birdlime may also be made from mistletoe berries, the bark of the wayfaring tree and other vegetables, by a similar process. Should any of it stick to the hands, it may be removed by means of a little oil of lemon or turpentine. Use. To rub over twigs to catch birds or small animals. It is said to be discutient when applied externally.

(7609) C. C. R. asks: 1. What is the prevailing belief among scientific men as to the nature of the electric current? A. That electricity is due to a vibration of the ether of space, and that light, heat, and electricity are simply different forms of manifestation of the energy of ether vibration. 2. If it is thought to be the molecular motion of the conductor, or motion of the intermolecular ether, what is the nature, as near as can be ascertained, of the motion? A. The office of the conductor seems to be to furnish a center or core, so to speak, for the electrical waves which pulsate through the space around the wire. By means of such waves wireless telegraphy is carried on. 3. What recent reliable treatise can I obtain upon the subject? A. We can recommend Barker's "Physics," advance course, price $3.50; Trowbridge's "What is Electricity?" price $1.50; Lodge's "Modern Views of Electricity," price $2.

(7610) A. L. Y. asks: Has the wind any effect on a thermometer, all other conditions remaining the same? A. If the air in the wind is at the same temperature, hour after hour, the thermometer will soon change to the temperature of the air which is blowing past it and in which it is. After that state is reached there can be no further change in the thermometer.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

FEBRUARY 28, 1899,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acetylene generator, J. G. A. Kitchen 620,148
Addressing machine, W. T. Cole 620,280
Air and gas engine, J. W. Eisenbuth 620,554
Amalgamator, A. H. Jocelyn 620,328
Annunciator drop, automatic indicating, Hewitt & Gapen 620,319
Asphalt apparatus, F. Burger 620,414
Asphalt plant, portable, J. A. McIntyre 620,555
Automatic brake, Lauer & Klossner 620,153
Automatic gate, J. E. Gibbs 620,441
Bale tie, W. J. Peppard 620,170
Barrel, R. J. & J. S. Wymond 620,525
Bath. See Electric bath.
Battery. See Secondary battery.
Battery solutions, utilizing spent, J. Lones 620,466
Beads, T. J. Garrigan 620,238
Bearing, antifriction, F. A. Sharpneck 620,190
Bearing retainer, ball, W. H. Binns 620,096
Bearing, roller, F. H. Richards 620,180
Bed brace, J. A. & F. M. Wilks 620,521
Beer, process of and apparatus for filtering and recarbonating, J. F. Theurer 620,379
Bell, Hunter & Storm 620,138
Bicycle, J. C. Fleming 620,294
Bicycle, J. F. Koehler 620,459
Bicycle adjusting mechanism, H. W. Lloyd 620,156
Bicycle attachment, F. A. Fisher 620,115
Bicycle brake, B. Lons 620,157
Bicycle lock, H. J. Breeze 620,221
Bicycle seat, A. K. Cross 620,284
Bicycle seat post, L. E. Crandall 620,422
Bicycle wheel, J. C. Fleming 620,295
Bicycles, compound or detachable gear for, J. T. Wells 620,390
Binder frame, H. P. Jones 620,455, 620,456
Binder, temporary, W. S. Mendenhall 620,159, 620,160
Bismuth compound and making same, H. Jansen 620,141
Board. See Wind board.
Boiler. See Steam boiler. Wash boiler. Water tube boiler.
Bolting cloth cleaning brush, H. H. Emminga 620,433
Book, account, Selden & Smith 620,506
Book, account, G. C. Shepherd 620,508
Book mark or leaf holder, J. E. Roantree 620,363
Book, paper, and lamp rest, Soderstrom & Nelsson 620,246
Bottles, device for preventing refilling of, E. W. Phinney 620,173
Box. See Provision box.
Box, M. S. Cadwell 620,538
Box filling machine, J. P. Wright 620,526
Bracket. See Curtain pole bracket.
Bracket arm, Z. R. Pinault 620,175
Brake. See Automatic brake. Bicycle brake. Pulley brake.
Brickwork tie, J. G. McDowell 620,349
Bridge gate, W. A. Fusch 620,116
Buggy top support, T. H. Mayfield 620,340
Bullet greasing machine, J. F. McGrail 620,350
Burial casket, C. M. Drennan 620,542
Burner. See Gas burner. Incandescent burner.
Burner for hydrocarburets, C. Rosier 620,185
Button, E. H. Danforth 620,425
Button making machine, F. G. Rodler 620,184
Button setting machine, E. Flagg 620,544
Button setting machine, I. A. Nash 620,550
Button, shirt collar, W. O. Wheeler 620,391
Cable grip, G. S. Fouts 620,438
Can. See Milk can.
Cane sling, D. H. Walsh 620,519
Car coupling, J. A. Graham et al 620,300
Car coupling, F. H. Stark 620,374
Car door, grain, L. Gookins 620,118
Car fender, H. C. Cady 620,275
Car for gravity railways, etc., pleasure, M. C. Campbell 620,415
Car replacer, J. Lanius 620,462
Car roof, A. N. Monteer 620,162
Carbureter, L. W. Ravenez 620,496
Card grinding apparatus, L. W. Penney 620,353
Carpet fabric, woven, R. S. & H. Cookson 620,104
Carpet stretcher, W. F. Grigsby 620,120
Cart, child's, I. N. Dann 620,107
Cartridge implement, S. B. Kitchel 620,330
Casting apparatus, metal, L. C. B. Holmboe 620,240
Casting machine, E. Ramsay 620,494
Centerboard for boats, portable, C. S. Hamilton 620,311
Centrifugal machines, tool for assembling and removing parts of, E. G. N. Salenius 620,366
Chain hook for logging chains, J. Poquette 620,177
Chair. See Folding chair. Window chair.
Checking and unchecking attachment, H. E. Twomley 620,382
Chimney cowl, E. Martin 620,472
Chute, cattle, Q. Bruton 620,099
Clamp. See Saw clamp.
Clamp, W. S. Ramseaur, Jr. 620,495
Cleaner. See Tube cleaner.
Closet repairer, P. Mueller 620,484
Closets, overflow, ventilating, and discharging fittings for, A. O'Brien 620,352
Clothes pin, wooden, F. B. Benton 620,093
Clothes, wall rack for drying, H. Bucklin 620,274
Coal separator, Caryl & Snyder 620,416
Cock and valve for bottles, etc., J. Bengue 620,535
Cock, blow off, D. B. Donnelly 620,287
Coffee roasting machine, E. M. Potter 620,355
Conveyer, A. J. Frith 620,299
Conveyer, D. J. Sheldrick 620,371
Conveyer, bucket, A. J. Frith 620,298
Coop, folding, O. Terry 620,512
Cornet, J. Heald 620,450
Cotton holder and waste receptacle, Browne & Harrison 620,222
Cotton pickers, portable shade for, M. M. Downer 620,109
Coupling. See Car coupling. Hose coupling. Shaft coupling. Thill coupling.
Crank hanger, adjustable, A. Levedahl 620,241
Cultivator, circular tree, G. G. Guenther 620,546
Cup polishing apparatus, O. F. Pira 80, 59
Cupola furnace, H. E. Machell 620,339
Current motor and operating same, direct, B. G. Lamme 620,333
Current transformer, multiphase, E. L. K. F. Kahlenberg 620,144
Curtain pole bracket, S. Ascher 620,268
Cut out, E. Ellicott 620,111
Cutter. See Lemon cutter.
Cycle handle bar, F. W. Lusebrink 620,242
Cycles, coin freed holder or stand for, A. C. Rice 620,361
Damper actuating device, J. P. Stearns 620,375
Damper regulator, J. C. Toomey 620,380
Darning apparatus, B. Baker 620,531
Dental flask, F. Groshans 620,303
Detergent, A. Bernhardt 620,407
Digging and harvesting roots of peppermint, machine for, A. M. Todd 620,198
Display cabinet, ribbon, J. D. Leen 620,464
Draught equalizer, W. F. Aidlott 620,528
Drawer guide, T. Hanson 620,447
Drier. See Grain drier.
Drill. See Grain drill.
Dye and making same, blue tetrazo, J. Schmid, 620,368, 620,369
Dye, blue cotton, R. Demuth 620,428
Dye, blue glycocol, K. Heumann 620,442
Dyeing loose stock, apparatus for, G. Mallinson 620,470
Dynamos, potential regulator for, A. A. Tirrill 620,514
Electric bath, four tub, C. E. Schnee 620,254
Electric meters, coin controlled mechanism for, W. F. Browne 620,537
Electric motor suspension, G. Gibbs 620,239
Electric motors, means for suspending, S. H. Short 620,256
Electric time switch, H. O. Swoboda 620,196
Electrical apparatus, coin controlled, R. W. Taylor, Sr. 620,197
Electrical distribution and regulation, system of, B. G. Lamme 620,336
Electrical distribution, direct current system of, B. G. Lamme 620,334
Electrical machine, G. F. Martin 620,473
Electrical transformers, automatic cut out for, W. J. Greene 620,302
Electrically heated tool, W. S. Hadaway, Jr. 620,306
Electromotive force regulation, means for and method of, N. Rowe 620,365
Elevator. See Passenger elevator.
Elevator safety device, L. W. G. Rolff 620,364
Elevator vent device, pneumatic, C. Bradford 620,270
Emergency screen for paying tellers, M. J. Carey 620,276
Engine. See Air and gas engine. Explosive engine. Rotary engine.
Engines, automatic controlling stop for, C. W. Boring 620,412
Exercising device, A. C. Mueller 620,346
Exercising machine, A. A. Hendrickson 620,453
Explosive engine for vehicles, J. W. Eisenhuth 620,431
Fabric. See Carpet fabric.
Fastener, C. A. Bryant 620,223
Faucet, F. Hassis 620,124
Faucet, can, G. F. Tong 620,262
Fence stays, tool for attaching, J. E. Boys 620,536
Fence, wire, D. P. Anthony 620,090
Fender. See Car fender.
Fertilizers, making, W. L. Goldsmith 620,443
File, bill, J. G. Aikin 620,211
Filter, J. R. Haselden 620,316
Filter, J. F. Ziegler 620,208
Filtering apparatus, R. Helwig 620,451
Firearm, magazine, W. W. Wood 620,524
Fire kindler, A. Seidlein 620,186
Fireproof floor construction, F. W. Settan 620,187
Fireproofing wood, etc., method of and apparatus for, J. L. Ferrell 620,114
Fishing reel, W. Washburn 620,388
Flowers, holder or supporter for cut, E. C. Murray 620,347
Flue stop, G. A. Higgins 620,129
Fly paper holder, R. D. Safford 620,505
Fly trap, automatic, M. S. Featherstone 620,292
Folding chair or seat, F. O. Brandt 620,220
Food from bananas and making same, cattle, O. Zurcher 620,209
Forts or fortifications, construction of, M. C. Mengis 620,161
Fruit gatherer, C. M. Stewart 620,195
Furnace. See Cupola furnace. Manufacturing or other furnace.
Furnace feeding apparatus, blast, E. E. Slick 620,510
Furnaces, grate for underfeeding, B. D. Childrey 620,103
Fuse, electric, W. S. Hadaway, Jr. 620,309
Gage. See Micrometer gage.
Game apparatus, E. K. Griesemer 620,445
Game croquet, W. G. Lake 620,460
Garbage drying and burning apparatus, J. J. Kennedy 620,458
Garment supporter, G. H. Blakesley 620,217
Gas burner, J. G. A. Kitchen 620,147
Gas burner igniters, manufacture of, M. Spier 620,511
Gas burners, lighting device for, E. S. Ullmann 620,516
Gas generator, R. Bocking 620,409
Gas generator, acetylene, M. L. Proctor 620,179
Gas generator, acetylene, B. F. Williams 620,394
Gas lighting device, M. Spier 620,557
Gases by refrigeration, especially applicable to separation of oxygen from air, apparatus for separating mixed, W. Hampson 620,312
Gate. See Automatic gate. Bridge gate.
Gearing, wheel, W. H. Monk 620,480
Generator. See Acetylene generator. Gas generator.
Glass tubing joint, G. E. Hoey 620,320
Gold from cyanid, extracting, W. A. Caldecott 620,100
Gold from ores, minerals, or other gold bearing substances, extracting, Black & Skeet 620,215
Grain drier, W. E. Ellis 620,432
Grain drill, J. E. Ricklefs 620,181
Grain drill shoe, Brennan & Christman (reissue) 11,729
Grain loader, M. L. Page 620,492
Grain shocking mechanism, A. P. Phillips 620,249
Grating, protective illuminative, C. E. Manning 620,471
Gun breech mechanism, J. W. Stockett 620,259
Gun carriage, A. Resow 620,359, 620,360
Guns, percussion lock for breech loading, C. Pohlit 620,354
Gynecological stirrup, J. A. Steurer 620,194
Harness ring, J. W. Fisher 620,543
Hat fastener, J. H. Roland 620,502
Hat fastener, J. Stauber 620,193
Hay and stock rack for vehicles, G. P. Holmes 620,322
Hay carrier, W. Louden 620,467
Headlight, J. L. Creveling 620,105, 620,229
Heater, C. Barnhart 620,212
Heel slug, boot or shoe, E. J. & M. D. Leighton 620,154
Hides or skins, machine for softening, G. W. Glazier 620,545
Hinge, mirror, S. Porter 620,551
Hoisting hook, G. B. McMerrick 620,351
Holder, C. T. King 620,145
Hook. See Chain hook. Hoisting hook. Snap hook.
Horseshoe, elastic tread, H. Schmid 620,253
Hose coupling, H. E. Reinisch 620,497
Humidifier, G. W. Voelker 620,385
Ice, apparatus for clearing channels of broken, O. Molbach 620,344
Incandescent arc light, W. S. Hadaway, Jr. 620,308
Incandescent burner, J. B. De Lery 620,338
Incubator, G. A. McFetridge 620,486, 620,487
Indicator. See Office door indicator.
Insect destroyer, A. C. Richardson 620,362
Insulation upon conductors, forming magnesia, W. S. Hadaway, Jr. 620,307
Iron. See Leuring iron.
Jacquard machine, double action, Stafford & Kelmel 620,372
Joint. See Glass tubing joint. Tube joint.
Keyhole guard, C. L. Wright 620,397
Kinetoscopic apparatus, mechanism for propelling and exposing films in, J. A. Prestwich 620,357
Knob and bell, combined door, J. W. Freeman 620,297
Labeling machine, bottle, V. Beauregard et al 620,534
Ladles, crucibles, etc., lining for, R. A. Hadfield 620,310
Lamp, acetylene, J. G. A. Kitchen 620,149
Lamp burner, J. H. Kahrs 620,457
Lamp carbon holder, electric arc, S. Bergmann 620,214
Lamp for electric lighting, arc, D. Gertin 620,117
Lamp, forced draught, R. Hitchcock 620,130
Lamp, vapor burning, L. C. Hills 620,454
Lamp, vehicle, J. W. Eisenhuth 620,110
Latch and lock, A. J. Stoops 620,377
Lathe, automatic spool, E. A. & G. M. Herrick 620,128
Lemon cutter and squeezer, W. Jaques 620,142
Leuring iron, W. S. Hadaway, Jr. 620,305
Lifting apparatus, J. H. Lorimer 620,158
Light. See Incandescent arc light.
Lighting and alarm device, combined, J. Thorsen 620,513
Lime, cement, or mortar, composition for making carbonated hydraulic, H. J. Livingston 620,155
Linotype and making same, A. E. Dowell 620,288
Linotype machine attachment, Trownsell & Trego 620,381
Lock. See Bicycle lock.
Lock, A. J. Stoops 620,376
Loom picker stick lug strap, C. W. Lyon 620,469
Loom warp stop motion, C. A. Littlefield 620,465
Manufacturing or other furnace, P. Boimare 620,097
Marking device, Romeyer & Josserand 620,503
Match machine, W. E. Cook 620,539
Matting for floors, J. A. Rennie 620,498
Mechanical movement, L. M. Gautier 620,439
Mercerizing apparatus, W. E. Aykroyd et al 620,530
Micrometer gage, G. J. Lavigne 620,337
Milk can, T. W. Forster 620,236
Mining apparatus, S. W. Wible 620,264
Mirror holder, B. Almonte 620,401
Moulding and vulcanizing apparatus, H. J. Doughty 620,233
Motor. See Current motor.
Motor, C. L. Wilkins 620,204
Motors, means for suspending, S. H. Short 620,257
Mower, lawn, J. Broderick 620,098
Musical instruments, adjustable extension rod for violoncellos or other, D. E. Whitton 620,393
Name plate, Clark & Wattson 620,419
Needle threader, J. Darling 620,540
Nicotine, extracting, F. D. Banning 620,406
Nipple turning device, W. A. Pratt 620,251
Nut lock, W. C. Bogard 620,219
Nut lock, J. H. Harnly 620,448
Nut lock, R. B. McLean 620,167
Nuts, automatic machine for tapping, W. R. Miner 620,475
Office door indicator, I. H. Harvey 620,315
Orchid receptacle, J. M. W. Kitchen 620,150
Ore roasting oven and cooling hearth, combined, H. C. Holtboff 620,132
Oven shelf, J. Hoysepian 620,524
Pants holder, J. T. Thorpe 620,260, 620,261

(Continued on page 158)

Paper making machine, Moore & White	620,548
Paper pulp digester, F. S. Lyman	620,243
Passenger elevator, J. McLean	620,245
Pedal, J. Wodiska	620,266
Pen, fountain, J. Blair	620,216
Perforating machine, J. J. Flett	620,436
Photographic plate holder, G. C. Stanley	620,373
Piano hammer head, S. W. Durham	620,430
Picture support, H. R. Brown	620,271
Pin. See Clothes pin.	
Pipe bending apparatus, H. F. Condon	620,227
Pipe coupling rust guard, J. E. Windle	620,265
Pipe or boiler covering, H. C. Michell	620,476
Pipe testing plug, pneumatic, J. J. Welstead	620,520
Pipe turner, S. McAdoo	620,165
Pistons, instrument for indicating continuously mean effective pressure on engine, W. Ripper	620,182
Placket closer, W. J. Worden	620,207
Placket fastener, skirt, T. Hollander	620,131
Plane, joiner's, J. M. Cole	620,226
Planter, combined corn and cotton, W. Sobey	620,191
Planter, corn, T. Frietschek	620,237
Plow, W. C. Cousins	620,228
Plow, J. C. Cox	620,421
Plow, revolving, M. C. Dethlefs	620,285
Plow, sulky, W. Sobey	620,192
Plow turning attachment, W. Kester	620,329
Post. See Wagon post.	
Post office boxes, indicating sign for, W. J. Williams	620,522
Postal card, D. W. Custer	620,423
Power, means for transmitting, H. Paulson	620,169
Projectile, F. Ahrens	620,400
Projectile, E. G. Wang	620,387
Propeller, screw, N. H. Borgfeldt	620,411
Propeller wheel, J. K. Bowman	620,413
Provision box, window, H. G. Plumb	620,176
Pulley brake and safety device, H. Bockmann	620,410
Pulley, sash, C. H. Ocumpaugh	620,489
Pump attachment, beer, Latimer & Crenshaw	620,463
Pump, force A. E. Whiting	620,392
Rack. See Hay and stock rack.	
Railway, electric, L. M. Aspinwall	620,404
Railway, electric, J. F. Munsie	620,549
Railway, pleasure, T. D. Holcomb	620,321
Railway switch, R. W. King	620,146
Railway tie shearing machine, W. Barth	620,533
Rake. See Stalk and hay rake.	
Razor sharpening device, F. L. Brunswick	620,273
Recording apparatus, electric, C. L. Jaeger	620,326
Recording system, electric, C. L. Jaeger	620,327
Reel. See Fishing reel.	
Reel mechanism, O. J. Kustner	620,332
Refrigerator car ventilator, Graham & Pierce	620,119
Refrigerator car ventilator, E. R. M. Pierce	620,174
Reversible wrench, T. F. Churchill	620,225
Ring. See Harness ring.	
Rock drill piston rods, adjustable guide for, F. M. Anable	620,267
Rolling black plate, W. H. Donner	620,541
Roofing tool, A. Danzer	620,426
Rotary engine, C. Cleave	620,219
Rotary engine, G. A. Culver	620,106
Rubber roll, G. P. Dodge	620,286
Rubber tubes, device for turning, W. A. Pratt	620,356
Running gear, O. Ahlbury	620,210
Sash fastener, M. P. Van Ryzin	620,199
Sash, window, J. C. Fleming	620,293, 620,295
Saw clamp, H. P. Schofield	620,255
Screen. See Emergency screen.	
Seal, car, W. M. Hope	620,323
Seal, safe, E. R. Applin	620,091
Sealing sheet metal cans, machine for hermetically, E. Norton	620,247
Seaming and curling machine, sheet metal, E. Zeh	620,398
Secondary battery, G. Philippart	620,172
Seeding machine, W. W. Schultz	620,370
Separator. See Coal separator.	
Sewing machine, S. G. Howe	620,134, 620,135
Sewing machine attachment, S. Chatfield	620,418
Sewing machine, hemstitch, J. Gutmann	620,304
Sewing machine work holder, E. M. Case	620,277
Shade hanger, S. Gray	620,301
Shaft coupling, antirattler, E. G. Medrick	620,341
Shafting, tubing, etc., construction of hollow, S. Vanstone	620,517
Shaving apparatus, I. Mazell	620,474
Sheet metal wheel, G. E. Mittinger, Jr	620,478
Shirt, W. M. Andrews	620,403
Shoe, G. W. Chase	620,278
Shoes, etc., fastener for, G. Barnes	620,532
Shovel, J. B. Perkins	620,493
Shutter fastener, F. Wankel	620,553
Signal system, E. L. & G. Hail	620,547
Siphon head, Welling & Fritz	620,389
Skiving machine, welt, E. E. Winkley	620,205
Snap hook, J. Wilson	620,396
Snow shed construction, C. F. McGlashan	620,244
Solar and transit instrument, J. B. Davis	620,427
Soldering lamp, P. & J. Heinz	620,127
Speed gearing, changeable, W. C. Iliffe	620,325
Speed of direct current motors, method of and means for varying, B. G. Lamme	620,335
Spinning device, F. L. White	620,202
Spoke fastening machine, R. O. Stutsman	620,378
Spraying implement, plant, A. J. Brummeler	620,272
Stacker, straw, W. W. Dingee	620,232
Stalk and hay rake, E. A. Morris	620,483
Staple forming and driving apparatus, B. A. & B. J. Grasberger	620,444
Steam boiler, R. J. O'Neill	620,168
Steamer, fruit, K. W. McNaul	620,488
Stereotype casting box, B. F. Curtis	620,230
Stereotypes, method of and apparatus for securing engraved plates to, S. H. Horgan	620,133
Sterilizing, disinfecting, etc., apparatus for use in, E. Fournier	620,437
Stone, compound for making artificial, H. S. Utley	620,383
Stone, etc., from kieselguhr, etc., manufacture of, C. Grunzweig	620,446
Stone, process of and composition for cleaning, F. W. Prentice	620,178
Stool, milking, A. Dahlstrom	620,424
Stove, C. H. Cosby	620,420
Stove, folding, J. Morawetz	620,345
Stove polish, W. Ayling	620,405
Stove, prospector's knockdown camp, F. Stapp	620,258
Stovepipe, L. W. Hemp	620,452
Stud, spirals, hand tool for forming, S. H. Hart	620,449
Sunshade, bicycle, E. F. Mellon	620,542
Superheating apparatus, P. F. Dundon	620,290
Surgical splint, R. W. Barton	620,556
Surgical table, S. Havnar	620,518
Suspender mounting, A. M. Ziegler	620,399
Suspenders, A. J. Jackson	620,140
Switch. See Electric time switch. Railway switch. Telephone switch.	
Syringe case, hypodermic, G. Ermold	620,434
Table. See Surgical table.	
Telephone switch, W. D. Gharky	620,440
Telephone switchboard, J. M. Overshiner	620,491
Thawing apparatus, steam, G. R. Elliott	620,112
Thawing frozen ground, P. Anderson	620,402
Thill coupling, J. C. Seymour	620,188
Tie. See Bale tie. Brickwork tie.	
Time recording and checking apparatus, workman's, W. Whitehead	620,203
Tin plate, machine for cutting triangular pieces of, T. E. Richter-Sips	620,499
Tire and rim for cycle or other wheels, pneumatic, Preston & Sibson	620,252
Tire for cycles, pneumatic, W. H. Sewell	620,507
Tire valve, pneumatic, E. P. L. Hardy	620,314
Tobacco treating machine, A. V. Hysore	620,139
Toe clip, P. E. Erickson	620,291
Top, spinning, J. Kjellen	620,151
Toy pistol, W. S. Vankirk	620,384
Train pipes, metallic pipe connection for, C. W. Vaughan	620,518
Transformer, regulating, Cowan & Still	620,283
Transformer regulation, rotary, R. D. Mershon	620,343
Trap. See Fly trap.	
Trolley wheel, sheet metal, G. E. Mittinger, Jr	620,479
Trousers, J. S. Fisher	620,435
Truck, adjustable traction motor, M. G. Hubbard, Jr	620,136
Truck, barrel, M. J. Knapp	620,331
Truck bolster, body and car, W. P. Bettendorf	620,269
Truck, car, J. C. Barber	620,092
Tube cleaner, W. M. Faber, Jr	620,113
Tube joint for metallic tubing, reinforced, F. A. Wilmot	620,395
Tube washing apparatus, F. Bubser	620,224
Tubes, apparatus for unifying sectional curvature of, Batcheller & Gundlach	620,213
Tug or carrier, shaft, H. A. Bierley	620,218
Turn bbr finishing machine, D. Schiffbauer	620,367
Tunneling device, B. F. Carpenter	620,102
Tunnels, constructing, B. F. Carpenter	620,101
Turntable lock, G. Rohrbach	620,500
Turntable operating mechanism, G. Rohrbach	620,501
Turning and polishing crooked or straight wooden rods or sticks, machine for, T. Kovatsch	620,152
Type bar, S. J. & E. S. Shimer	620,509
Type line bars, means for forming, A. E. Dowell	620,289
Typewriter, Hatch & Hillard	620,125
Typewriting machine type, W. C. Hull	620,137
Typographic machine, Risley & Lake	620,183
Umbrella cover tip, J. F. Witt	620,206
Umbrella, folding, Rosenholz & Lampe	620,504
Undergarment, N. Hatch	620,317

(Continued on page 159)